TECHNOLOGY DEPARTMENT

AVIATION WEEK

A McGRAW-HILL PUBLICATION

DEC. 20, 1948

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Pressure (0-3000 psi)	1½ x 1½ x 1 13/16 long	0.75 lbs. (TTP-6A)
Motion linear or angular	1⅜ dia. x 1 13/16 long	0.45 lbs. (TTI-3)
Strain gage Oscillator	6 13/16 x long x 1 7/16 x 1 5/16	0.40 lbs. (TOR-4A)
Temperature gage Oscillator	6 3/16 x 1 7/16 x 1 5/16	0.40 lbs. (TOR-4A)
Voltage Oscillator	4½ x 1 7/16 x 1 5/16	0.35 lbs. (TOE-8A)
Current Oscillator	4½ x 1 7/16 x 1 5/16	0.19 lbs. (TOX-4A)

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Bendix Aviation Corporation
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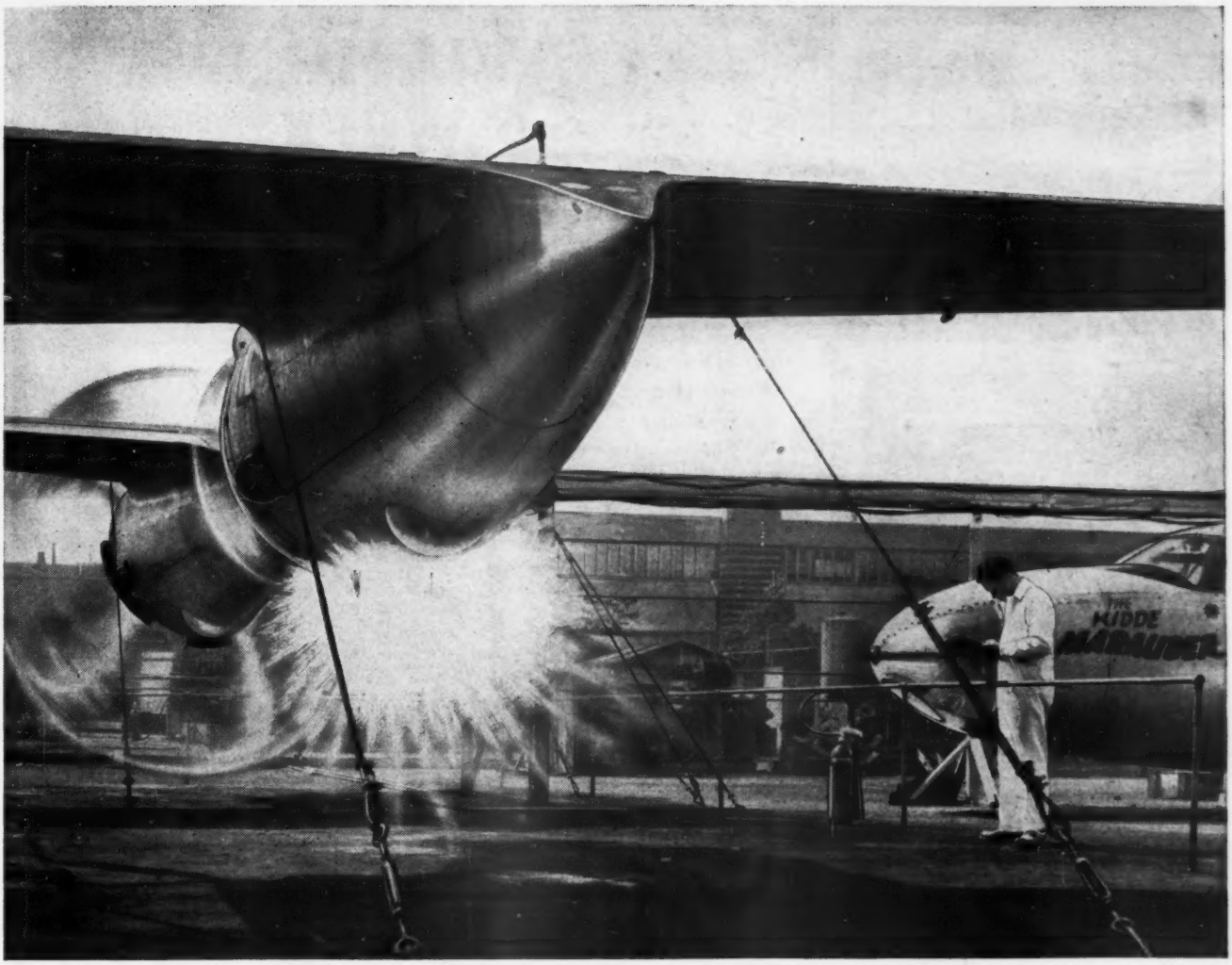

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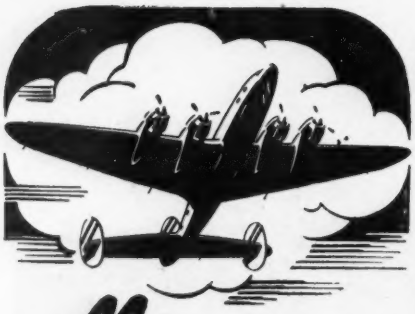
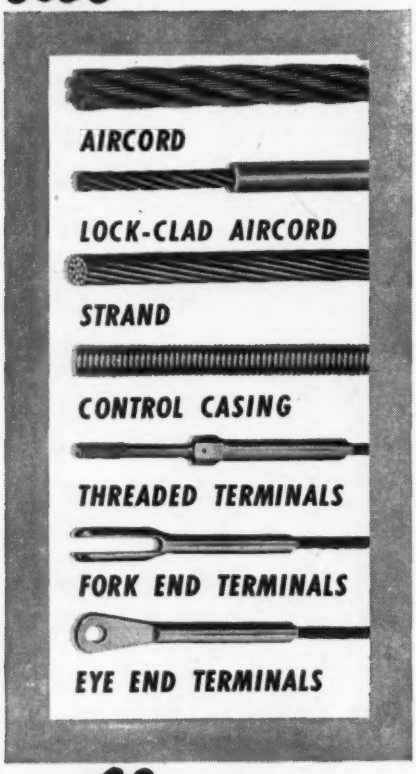


all TOPFLIGHT



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Vol. 49, No. 25

AVIATION WEEK

December 20, 1948

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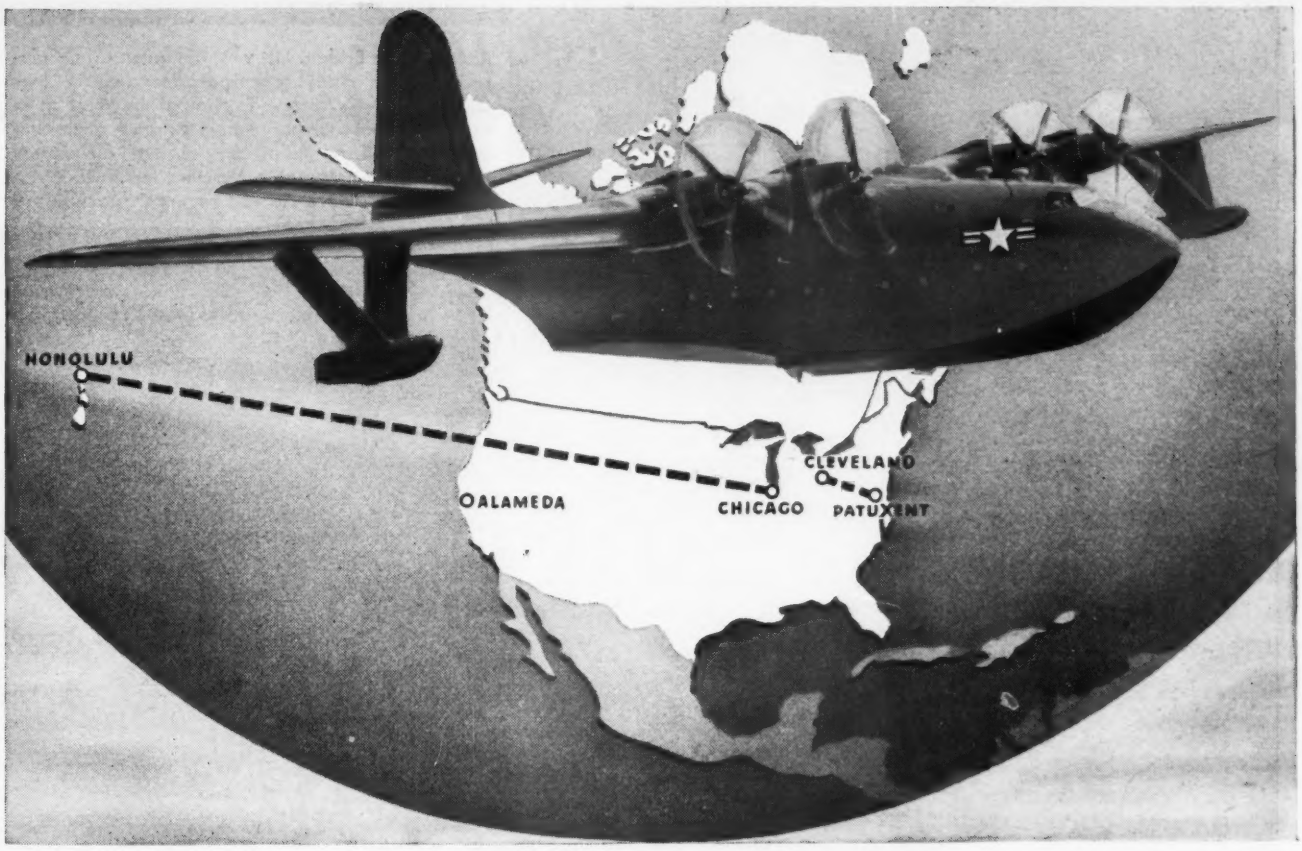

Martin MARS Writes the Future of Seaplanes in Today's Navy Records*

With a series of record-breaking flights, the Navy's new Martin JRM-2 Caroline Mars has refocused attention on the importance of seaplanes in modern military supply planning. And further emphasized the reputation of Martin flying boats for high performance, endurance and reliability! First the Caroline Mars cracked the non-stop seaplane record with a 4748-mile-flight from Honolulu to Chicago. A few days later, this mighty ship carried the highest airborne tonnage in history, flying 68,283 lbs. from Patuxent, Md., to Cleveland. Now, this latest Martin Mars is in service in the Pacific, regularly carrying 39,000 to 40,000 lbs. over the 2,400 miles from Alameda, Cal., to Honolulu!

Said Vice Admiral John D. Price, Deputy Chief of Naval Operations: "Squadron VR-2 with its 145,000-lb. JRM-1 flying boats has provided outstanding evidence of the significant role which large flying boats can play in meeting the logistic needs of national defense. Requiring no prepared forward bases . . . the flying boats can provide air lift in large tonnage volume with efficiency and economy of operation and complete mobility as to bases. Carrying even larger loads than its sister ships, the Caroline Mars will provide an important boost to the total air lift available in the Pacific."

It's another Martin "first" . . . building air power to save the peace, air transport to serve it!

THE GLENN L. MARTIN CO., BALTIMORE 3, MD.

* **RECORD-BREAKING FLIGHTS:**

	Distance	Payload
HONOLULU TO CHICAGO	4748 miles (plus 42 crewmen and passengers)	14,000 lbs.
PATUXENT, MD. TO CLEVELAND	390 miles (longer than the Berlin air lift)	68,283 lbs.

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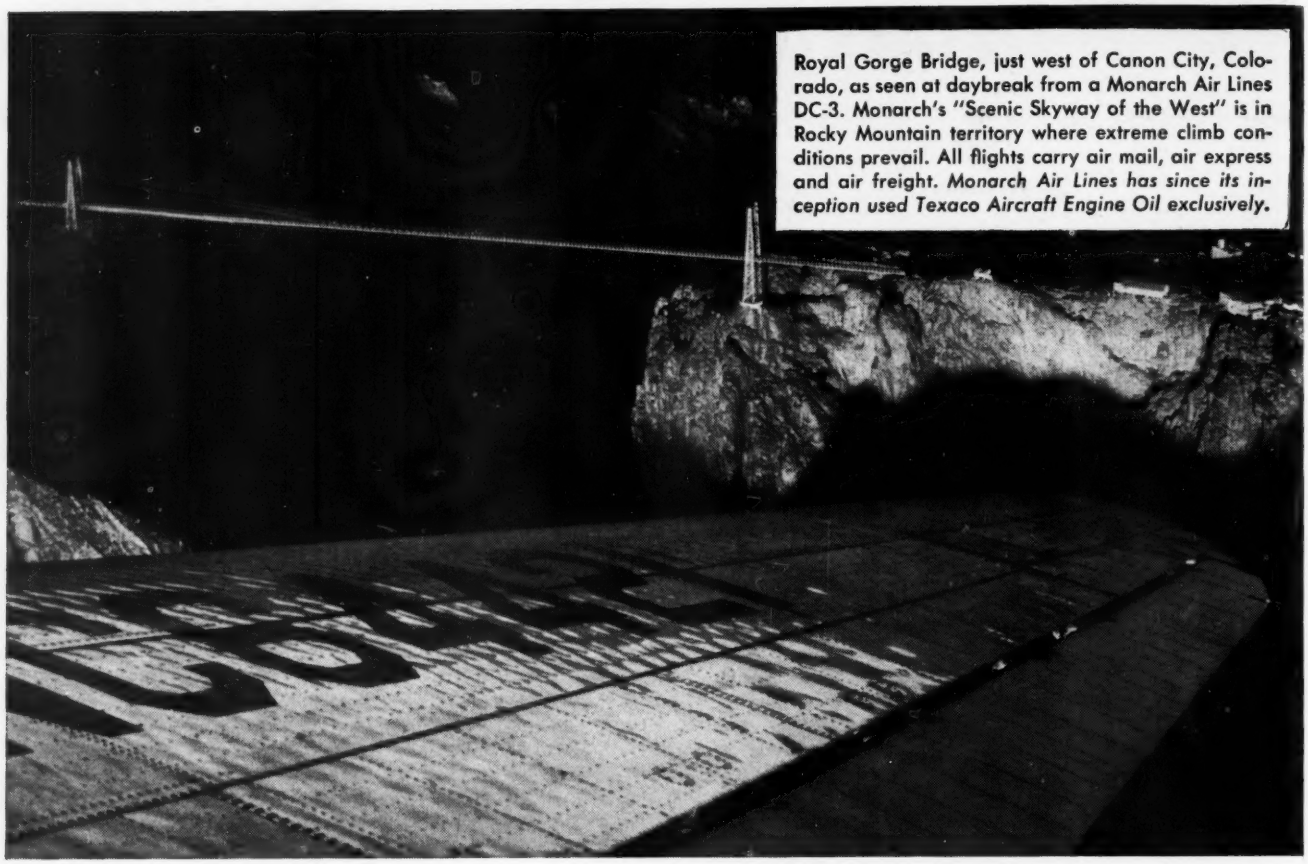
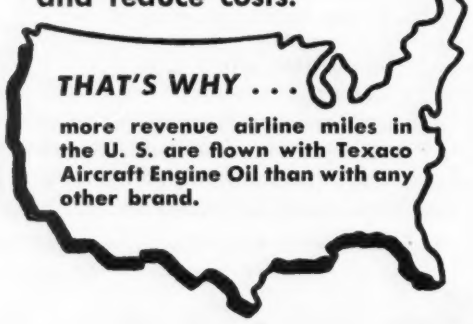
Builders of Dependable Aircraft Since 1909



Royal Gorge Bridge, just west of Canon City, Colorado, as seen at daybreak from a Monarch Air Lines DC-3. Monarch's "Scenic Skyway of the West" is in Rocky Mountain territory where extreme climb conditions prevail. All flights carry air mail, air express and air freight. *Monarch Air Lines has since its inception used Texaco Aircraft Engine Oil exclusively.*

How "feeders" can get major Airline Maintenance Economies

Use Texaco Aviation Products and Lubrication Engineering Service. They increase efficiency and reduce costs.



YOU can gain a lot of practical know-how about aviation maintenance from Texaco Lubrication Engineering Service . . . help and counsel on best layout for maintenance shops . . . best lubrication practices . . . efficient methods of storing and handling lubricants and fuels . . . proper servicing methods . . . and much else besides.

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FOR THE AVIATION INDUSTRY

Tune in . . . TEXACO STAR THEATRE presents MILTON BERLE every Wednesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

NEWS SIDELIGHTS

Procurement Shifts

More shifts in fiscal 1949 Air Force procurement funds have been made as predicted in AVIATION WEEK, Oct. 25. Latest axe has fallen on letters of intent for jet fighters to the tune of about $30,000,000.

This money, combined with the $80,000,000 recovered in cancellation of the Curtiss-Wright F-87 contract, gives the Air Force about $110,000,000 to spend on other types.

Included in the new allocations that are now in Forrestal's office are a sizeable purchase of the Fairchild XNQ trainer, some more Lockheed TF-80C jet trainers and jet fighters of a more advanced design than those called for in the cancelled contracts.

Air Force Strategy

Recent blasts by Shell Oil's Jimmy Doolittle and American Airlines' C. R. Smith urging merger of the U. S. Air Force and Naval Aviation into a single air force are the opening guns in a campaign to take Naval Aviation from under the wing of the Navy. Smith is president of the Air Force Assn. and Doolittle is chairman of its board of directors.

Air Force Assn. voted for merger of the two air forces at its convention last September and has apparently been picked to spearhead this campaign because its leaders are not bound by the Forrestal gag rule which silences military personnel in discussing inter-service rows. However AFA has Air Force officers now on active duty on its membership rolls. C. V. Whitney, assistant secretary of the Air Force, is also an AFA director.

In the coming Capitol Hill battle on the fiscal 1950 budget, Air Force strategy will be to let AFA spokesmen deliver their public blasts and rely on air power stalwarts in the House and Senate to make the necessary budget shifts. Air Force leaders will remain in the background, at least publicly, to avoid the charge of openly bucking administration policy.

Hoover on CAB

The Commission on Reorganization of the Executive Branch offered hope last week to airline representatives who are fearful that Civil Aeronautics Board might be merged with Interstate Commerce Commission in a reorganization of Washington's too-numerous agencies.

The Commission, headed by former President Herbert Hoover, officially reported that "no change would be proposed in the status of the regulatory agencies, such as the Securities and Exchange Commission, the Interstate Commerce Commission, and the like, which are responsive to Congress and are not part of the executive establishment."

Hoover Commission spokesmen said that this referred to CAB. However, the Commission's decisions are still subject to review and modification. There is some possibility that the Commission will recommend coordination between CAB and ICC activities, in the large area in which the actions of one agency affect the field under regulation by the other agency.

Forrestal's Position

Don't be fooled by the flurry of Washington press stories on how solid Defense Secretary Forrestal now stands with President Truman.

Most of these stories were carefully planted among Forrestal's favorite correspondents—the regular attendants at the Forrestal intimate buffet suppers. Actually, Forrestal got a cool reception from Truman at Key West, and Washington observers still expect him to disappear from the defense picture after the fiscal 1950 military budget has been shepherded through Congress.

Forrestal has never been an enthusiastic supporter of air power and has had many a sharp brush with the independent U. S. Air Force during its fledgling year.

Just in Case

A little-known contract between Dr. Alexander Wetmore, secretary of the Smithsonian Institution and the executors of the Orville Wright estate, was signed before the executors consented to deposit of the plane in the National Museum, in the Institution's custody.

The contract prescribes the label displayed with the plane, and specifies that the plane shall remain in its present place except temporarily for maintenance or protection, unless it is transferred to a special place of honor in another national aviation museum in the metropolitan area of the national capital (presumably the new National Air Museum which is now in planning stage).

The contract provides that neither the Smithsonian Institution or any agency administered by it or its successors "shall publish or permit to be displayed a statement or label in connection with . . . any aeroplane model or design of earlier date than the Wright aeroplane of 1903 claiming in effect that such aircraft was capable of carrying a man under its own power in controlled flight." In event of deviation from this requirement, and failure to remedy the deviation within 12 months after written notice, the title of the plane would revert from the United States to the Wright estate.

Russell For Tydings?

There is some speculation on Capitol Hill that Democratic Sen. Richard Russell (Ga.) will fall heir to the chairmanship of the Senate Armed Services Committee, scheduled to take up legislation authorizing the 70-Group Air Force program. Democratic Sen. Millard Tydings (Md.) is first in line for the post.

Tydings is reported to be seeking a position on the Senate Foreign Relations Committee. As a price for this coveted assignment, Tydings would have to give up his membership on the Senate Appropriations Committee, and might have to surrender the Armed Services chairmanship.

Russell ranks under Tydings on Armed Services and is also a high ranking member of the Appropriations Committee. Russell, like his Georgia colleague, Rep. Carl Vinson, scheduled to become chairman of the House Appropriations Committee, is a strong proponent of the 70-Group USAF.

Douglass Stays On

Chairman Frank P. Douglass will remain as a member of the National Mediation Board for another three-year term beginning Feb. 1. Douglass, a member since 1944 of NMB, had planned to retire and return to Oklahoma when his present term expired Jan. 31 (AVIATION WEEK, Nov. 1).

After visiting the White House recently Douglass said President Truman had asked him to reconsider. "At the President's request," Douglass told reporters, "I agreed to stay on indefinitely." This would indicate Mr. Truman's intention to reappoint Douglass to another three-year term. The chairmanship rotates annuallly among the three NMB members.

AVIATION CALENDAR

Dec. 21-22—University Farm Short Course for Dusters and Sprayers, Minnesota Department of Aeronautics.

Jan. 5, 1949—Florida Flying Alligator Club, 14th annual reunion, Melbourne, Fla.

Jan. 7-9—Miami All American Air Maneuvers, Miami, Fla.

Jan. 10-11—National Aircraft Standards Council steering committee meeting, AIA offices, Hollywood, Calif.

Jan. 10-14—Materials Handling Show, sponsored by the American Society of Mechanical Engineers, Convention Hall, Phila.

Jan. 10-14—Society of Automotive Engineers, Annual Meeting and Engineering Display, Hotel Book-Cadillac, Detroit, Mich.

Jan. 11—ICAO Communications division, Montreal.

Jan. 12—SAE annual meeting dinner, Detroit Masonic Temple.

Jan. 12-14—Commercial Spray Operators conference, University of Illinois, Urbana, Ill.

Jan. 13-14—Fourth NAS Council meeting, AIA offices, Hollywood, Calif.

Jan. 13-14—National Aircraft Standards Council meeting, Los Angeles.

Jan. 18-Feb. 11—Third Air Transportation Institute, American University, Washington, D. C.

Jan. 20-22—"Minute Plant" conference, Society for advancement of Management (panel discussions on procurement program and industrial preparedness), Chicago.

Jan. 24—Honors Night dinner, Institute of the Aeronautical Sciences, Hotel Astor, New York City.

Jan. 24-27—IAS seventeenth annual meeting, Hotel Astor, New York City.

Jan. 27—Society of Automotive Engineers, metropolitan section, fuels and lubricants meeting, Engineering Societies Bldg., New York City.

Feb. 8—ICAO Operations division, Montreal.

Feb. 22—ICAO Airworthiness division, Montreal.

Mar. 3—Society of Automotive Engineers, metropolitan section, air transport meeting, Engineering Societies Bldg., New York City.

Apr. 3-6—American Association of Airport Executives, Oklahoma City.

Apr. 11-13—Society of Automotive Engineers national aeronautic and air transport meeting, Hotel New Yorker, New York.

Apr. 11-16—Western Metal Congress and Exposition, sponsored by American Society for Metals, Shrine Civic Auditorium, Los Angeles, Calif.

July 3-4—First Annual Southern California International Air Race, Long Beach.

July 13—ICAO North Pacific regional air navigation meeting, Seattle.

Aug. 24—ICAO African-Indian ocean air navigation meeting, Algiers.

Aug. 29—Federation Aeronautique Internationale, Cleveland.

PHOTO CREDITS

13—(left) American Airlines, (right) PAA; 14—(top left) Bell Aircraft Corp., (top center) NACA, (top right) INP, (bottom) USAF; 15—Navy; 16—Beech; 17—TEMCO; 21-23—Northrop; 30—Bell.

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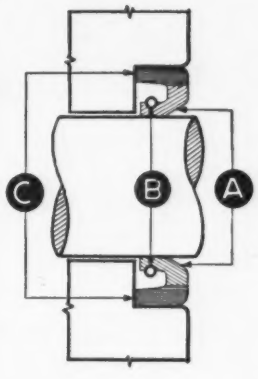
...AN OIL SEAL THAT'S *Flexible?*

TWIST IT . . . squeeze it . . . drop it . . . hammer it—the new one-piece concentric molded J-M Clipper Seal has plenty of give and take to help it stand up in service.

This flexibility has its advantages. The Clipper Seal's hard, tough outer heel, for example, is resilient enough to conform even to a slightly out of round cavity. Yet the soft, pliable *inner* lip always maintains a light, but positive sealing pressure on the shaft, with minimum wear on the seal.

The simple design of Clipper Seals also assures quick, easy installation, and permits removal without damage so that the seal may be used again. And because Clipper Seals are entirely non-metallic, they eliminate any possibility of electrolysis or corrosion.

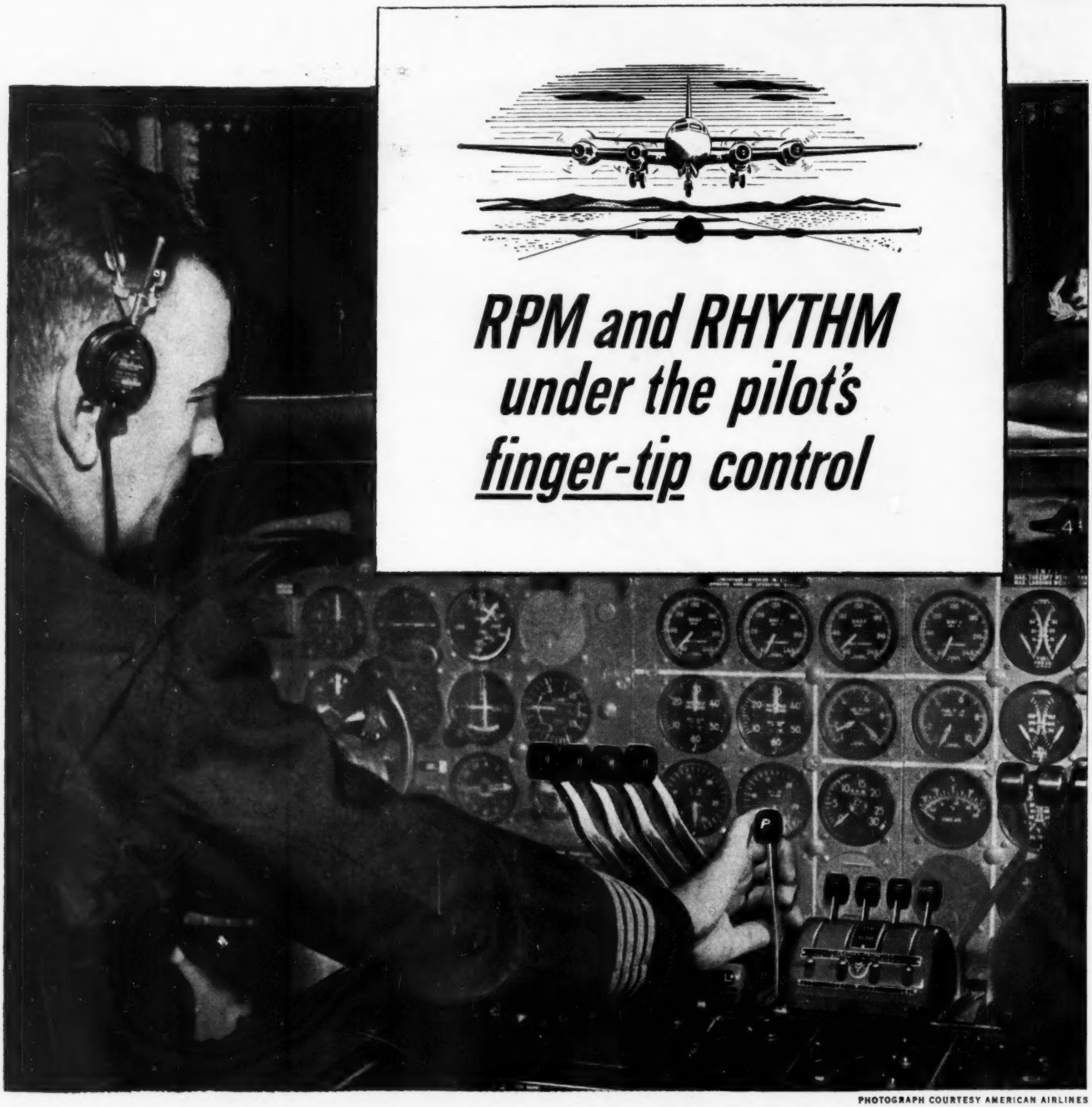
Clipper Seals are made in both split and endless types . . . are available for shafts in sizes from ¼" I.D. up to 68" O.D. They are for sealing against oil, grease, water, coolants at operating temperatures up to 450°F. Write for folder PK-31A to Johns-Manville, Box 290, New York 16, N. Y.



Here's how *Clipper Seal* works:

The lip (A) is held in light but firm contact with the shaft by means of a specially designed garter spring (B). Pressure on shaft is carefully pre-determined to minimize wear, yet effectively seal against leakage. The heel (C) provides a press fit in the cavity, assuring a tight lubricant-retaining seal at this point also. This design is readily varied to meet special conditions.

Johns-Manville **PACKINGS & GASKETS**



RPM and RHYTHM under the pilot's finger-tip control

PHOTOGRAPH COURTESY AMERICAN AIRLINES

● CURTISS AUTOMATIC SYNCHRONIZATION makes propeller RPM control and engine RHYTHM a simple, one-lever, finger-tip operation for pilots of modern multi-engined airliners.

● A single lever propeller RPM control — located in the cockpit — establishes the constant speed setting for each flight condition.

. . . and at the same time maintains accurate synchronization — uniform RPM — of *all* engines through an automatic synchronizer master unit.

● As a result, CURTISS AUTOMATIC SYNCHRONIZATION . . .
. . . eliminates noisy, tiring, off-rhythm engine "beat."

. . . releases the pilot for other important duties during *take-off, climb, let down* and *landing.*

. . . assures more comfort and relaxation for himself, his crew and his passengers.

***Other famous Curtiss Propeller features* include *reverse thrust* and *hollow steel blades.* Like *automatic synchronization,* these features were first introduced to service by Curtiss and service-proved on commercial airline and military aircraft.**

A PRODUCT OF
PROPELLER DIVISION CURTISS WRIGHT CALDWELL, NEW JERSEY
FIRST IN FLIGHT

CURTISS ELECTRIC PROPELLERS

NEWS DIGEST

DOMESTIC

Philip S. Hopkins, vice president of Link Aviation, Inc., was given Brewer Award by National Aeronautics Assn. for contributions to aviation education in 1948. He is president of the Binghamton, N. Y., board of education.

Arthur M. Hill resigned as chairman of the National Security Resources Board. Temporary replacement is John R. Steelman.

New air terminal in New York City will be built by a municipal agency near First Ave. and 37th St. to replace present overcrowded building at 42nd St. and Park Ave. Structure, to be ready in a year, will be about ten stories, with ground and mezzanine floors leased to airlines.

Weston B. (Bert) Hall, pioneer flyer and a founder of the Lafayette Escadrille in World War I, died of heart disease in Fremont, Ohio. He was 62.

Airlines War Training Institute donated $6000 to Air Force Aid Society. AWTI President S. J. Solomon explained it was balance of organization's proceeds, except for small sum to cover storage of records and possible tax liability. AWTI was formed during the war to collect and distribute indoctrination literature for airline pilots on war transport duty.

FINANCIAL

Bell Aircraft Corp. declared dividend of $1 a share payable Dec. 28 to holders of record Dec. 21, payment to be made from surplus.

North American Aviation, Inc. declared dividend of 50 cents payable Dec. 27 to holders of record Dec. 17. Similar amount was paid Sept. 29.

Sperry Corp. declared $1 semi-annual dividend payable Dec. 28 to holders of record Dec. 17.

Cessna Aircraft Co. reports profit of $552,898 for year ended Sept. 30 on sales of $14,295,221, nearly one-half from non-aviation production.

Beech Aircraft Corp. directors voted stock dividend of one-half share for each share of outstanding common, and quarterly cash dividend of 25 cents a share (payable also on dividend stock), both payable Jan. 20 to holders of record Dec. 31. For fiscal year ending Sept. 30, profit was $2,213,626. Oct. 1 backlog was $17,600,000.

FOREIGN

French Air Force has taken five British deHavilland Vampires for service trials, with the strong possibility that there will be further deliveries from Britain of Vampire models that now are surplus.

INDUSTRY OBSERVER

► Navy has finally selected 30 more aircraft to be purchased with their fiscal 1949 procurement funds. Awaiting approval is a contract for 28 North American AJ-1 combination jet and reciprocating engine attack planes for carrier use, and two Lockheed Constellation transports. The latter will be equipped with special radar equipment and be used for picket and anti-submarine duties.

► Lockheed is working on a new twin-engine freight plane designed for one-stop transcontinental service. The new design, known as the L-163, is being pushed for both military and commercial markets.

The L-163 was developed from the basic design of the Navy P2V patrol bomber. The cargo liner will use the same wing and empennage as the P2V.

A new model of the Shooting Star series jet fighter is also in the mill. It will be three feet longer than the F-80C or approximately the same length as the two-seater trainer version (TF-80C) now being built for both the Air Force and Navy.

► Secretary of Air Force Symington reveals that the cost of propellers for one B-36 bomber is $168,000, which is $43,000 more than the total first annual budget for the Air Force in 1911.

► McDonnell has revived its twin-engine helicopter project (HJH-1) after eliminating the excessive vibration that once caused shelving of the project. Shock-mounted rotor heads eliminated most of the vibration and McDonnell now expects good performance from the model.

► First automatic pilot for helicopters has been developed by Coast Guard Cmdr. Frank Erickson. Big problem was developing controls for flying sideways and backwards.

► French military aviation mission now in this country will concentrate on Republic and Grumman. Big French need is for jet fighters and they are particularly interested in Grumman's experience in building an airframe for the British Nene jet engine. France plans a similar deal with the British.

► Czech air lines have purchased two Russian IL-12 transports. The IL-12 is a Russian-designed 24-passenger twin-engine tricycle gear transport. Russian domestic air lines are now operating a fleet of about 200 IL-12 transports. Negotiations for Czech purchase of four giant IL-18, 70-passenger transports, are in progress. They will be used on the Czech's route to India.

► Air Force is installing a moving target indicator on its traffic control radar at Templehof Airdrome, key spot on the Berlin airlift. Crew from Airborne Instruments Laboratory, Mineola, N. Y., is handling the installation. The moving target indicator eliminates all ground clutter on the radar scope and records only moving targets thus giving a clearer picture of air traffic within radar range.

► Pan American Airways plans to have five Stratocruisers by the end of January. Three will be used on the San Francisco-Hawaii route; one on the Atlantic and one retained for training. In face of the Port of New York Authority's ban on planes of more than 105,000 lb. gross weight at LaGuardia, PAA is quietly gathering figures from Boeing on affect of Stratocruiser landings and takeoffs on Seattle Airport, which it plans to present to the Port Authority in an effort to obtain permission to operate Stratocruisers from LaGuardia.

► Royal Canadian Air Force procurement funds, include an order by Royal Canadian Air Force for 29 Canadian-built DC-4M North Star transports from Canadair Ltd., Montreal, at cost of $18,000,000; refitting and modernizing 209 RCAF service planes at estimated cost of $10,377,000; expenditure of more than $6,000,000 on jet engine research and experimental construction at A. V. Roe Canada Ltd., Toronto; purchase of military aircraft from United States and Great Britain at cost of $7,000,000.

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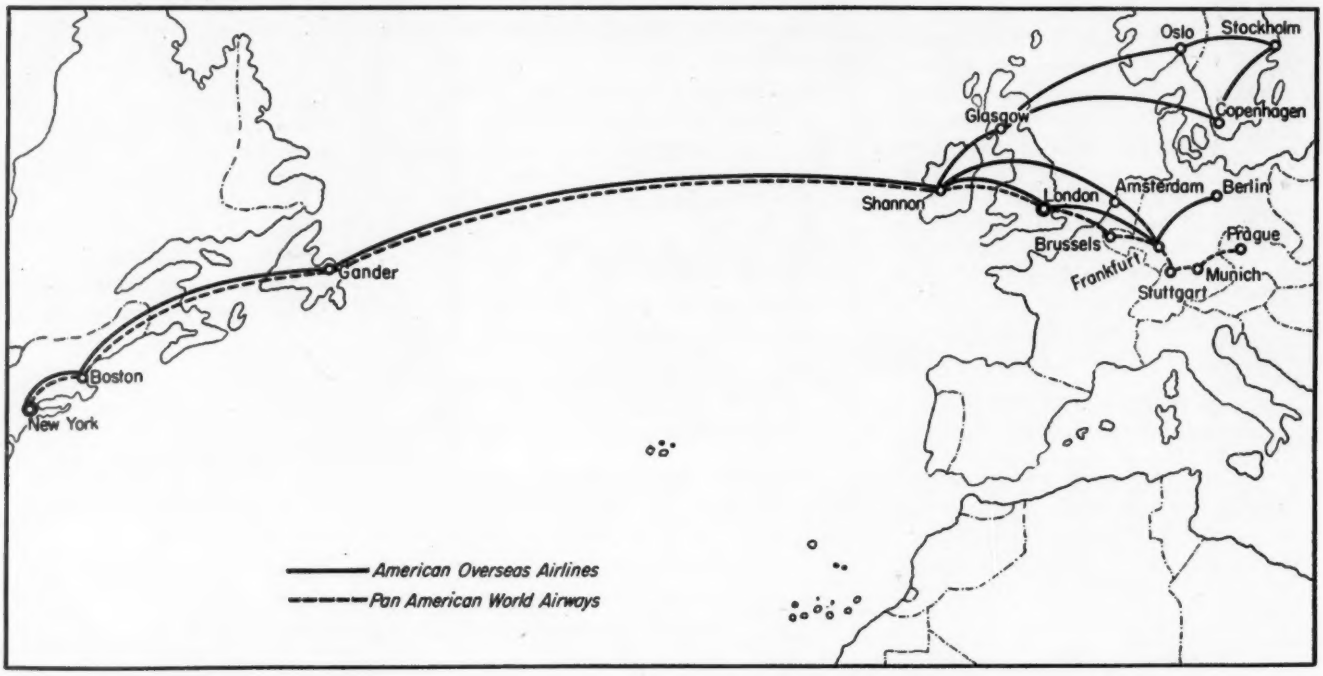


AT STAKE, principally, in Pan American's proposed purchase of American Overseas Airlines are these main trans-Atlantic routes of the two companies. AOA also has a link to Scandinavia via Iceland. The paralleling on the heavily-traveled New York-London segment makes a natural study for merger. Route certification for both carriers extends eastward beyond the points shown.

PAA-AOA Deal Now Up to Government

Pan American to buy Atlantic rival with a stock transfer involving no cash payment.

By William Kroger

In the boldest, most financially complicated undertaking in recent airline history, Pan American Airways has moved to strengthen its position on the North Atlantic by buying its most direct competitor and oldest U. S. rival, American Overseas Airlines.

American Overseas has agreed to sell all its assets to PAA in exchange for stock in PAA, but the sale has a long road to travel before completion. Auditors must agree on the value of the two companies as a basis for the stock transfer. The Civil Aeronautics Board must approve the sale and the President may have to pass on some aspects of it. Stockholders of the two companies must approve. The position of American Export Lines, now a 20 percent minority stockholder in AOA, must be clarified. And many other conditions must be met.

▶**CAB Question**—No one knows now what the Board's attitude will be. Top CAB officials were sounded out informally on the arrangement by PAA and AOA executives, but were told the Board would not give an opinion until the case came before it. Petition for approval, together with the sales agreement, was filed last week. CAB belief is that the President will have to okay the deal, as it involves foreign routes.

If all conditions of the sale haven't been fulfilled in six months, AOA and PAA can cancel the deal. But by that time both companies hope the government will have approved. If so, here's what will happen, as set out in the agreement between the two carriers:

Pan American Airways, Inc. (the operating company) will acquire all the stock of Pan American Airways Corp. (a holding company), a total of 10 million shares at par value of $2.50, of which 6,145,082 are issued.

American Overseas Airlines will receive PAA stock equivalent to the value of its 1,749,825 outstanding shares at an average cost of $10.77 a share, or its net book value as of Dec. 31, 1948, whichever is higher. Value of PAA stock also would be computed on basis of book value as of Dec. 31.

▶**Open Books**—Books will be kept open to allow for any mail pay adjustments before Apr. 30, 1949, covering years 1946, 1947 and 1948. (AOA has just received $174,517 additional mail pay for 1945.) No later than May 5, the auditors will report on the book value of the two companies.

Pan American Airways will have to obtain loans of $10 million in addition to its present $40 million line of credit, of which it has drawn $10 million. AOA is to try to persuade its bankers to extend part of that sum. This sum is a cushion, possibly to be used to take care of AOA equipment obligations that might fall due while the deal is pending.

The two companies must each hold stockholders' meetings within 45 days after government approval, PAA Corp. to hand itself over to PAA, Inc., and

AOA to accept or reject PAA's offer. Any opposition from American Export to AOA's part in the transaction is likely to come at or just prior to the stockholders' meeting.

Assuming the stockholders approve, the PAA stock would be distributed to AOA stockholders. Then AOA would be dissolved and PAA could not use the word "Overseas" in its title or operations in any way.

▶**Voting Trust**—American Airlines, as the largest stockholder in AOA, would wind up a substantial stockholder in Pan American. So the sales agreement provides for a voting trust to hold that stock. One trustee would be selected by American, one by PAA and the third by mutual agreement. The trust would have a life of seven years, and could be extended another three years. It is AA's intention to dispose of its Pan Am stock, either on the market, under controlled conditions, or by distribution to American stockholders.

Pan American would acquire from AOA, in addition to certificates, various installations and other tangibles, seven L-49 Constellations, five DC-4s and the eight Boeing Stratocruisers AOA has on order. The agreement permits AOA to sell one DC-4 for each Stratocruiser delivered in the interim.

Unofficially, it is understood that the proximity of AOA's Stratocruiser deliveries (first sometime late in January or early in February), was one of the key factors in AOA's decision to sell to Pan Am. The eight planes will cost about $15 million. AOA has paid about $4 million on them. There is supposed to be outstanding a line of credit to cover the balance, but it does not show on the balance sheet of AOA and PAA sources feel confident that the stipulation that PAA obtain loans of $10 million was solely to cover cost of AOA's Stratocruisers. That loan is so important that the agreement will be cancelled if PAA can't raise the money.

▶**Smith Explains**—But even more revealing are the reasons for the sale stated by AOA President C. R. Smith: "...The slow revival of normal trade and commerce between the U. S. and Europe: the fact that the foreseeable volume of business does not justify the continuation of three competing U. S. carriers on the North Atlantic route; the increased subsidy which will be required to sustain three carriers: and the difficulty of securing the additional capital which will be required for the future."

Smith, after about five years, thus may have finally accepted the basic tenet of PAA President Juan T. Trippe that U. S. carriers should not compete with themselves when they also have to compete with foreign airlines.

As late as November (the sales agreement was announced Dec. 13) AOA still was gaining ground on its 9134 route

C. R. Smith

Juan Trippe

miles over the North Atlantic. It flew 84 percent more passengers in November, 1948, than in November, 1947. In October, its load factor was 75.6. Through November, AOA carried 22 percent of the eastbound traffic, as against PAA's 20 percent. TWA, the other U. S. trans-Atlantic carrier, led them both with about 25 percent.

Financially, AOA also was doing well. Through September it netted $742,932 this year on total operating revenue of $16,847,814. Its third quarter earnings were $1,659,834.

▶**Airlift Factor**—But AOA's traffic and profits have been based on service to Frankfort in connection with U. S. occupation of Germany and the Berlin airlift. Political changes in that situation would hit AOA hard.

Moreover, the foreign carrier share of Atlantic traffic has been growing. According to Trippe, foreign lines have upped their proportion of traffic 50 percent in the past year. AOA, with its seven-year certificate expiring in July, 1952, was faced with two alternatives: expensive expansion, or withdrawal.

Smith's company, American Airlines, was instrumental in creating the situation from which it now wishes to withdraw. With TWA, American sparked the Airlines Committee for U. S. Air Policy which was formed by 16 domestic airlines in 1943 specifically to persuade the government to create more Atlantic-Pacific competition for PAA.

▶**After AmEx**—When CAB ordered American Export Lines steamship company to give up control of American Export Air Lines, first U. S. competition given PAA on the North Atlantic, it was natural that American buy AmEx (which became AOA). Smith returned from the Air Transport Command with the intention of building AOA into a world-wide adjunct of AA. John E. Slater, who had helped form AmEx, battled PAA, and was the steamship company's representative in AOA, became board chairman when Smith took over AOA's presidency.

Slater resigned from AOA Nov. 19, but his action was not announced until after news of the impending sale became public.

Trippe was the natural adversary of Smith and Slater. With a sea-going ancestry, he named his company's planes Clippers and thought in terms of world trade. His unshakable belief that U. S. carriers should not compete with each other while foreign lines ran off with the bulk of the trade was exemplified in the Congressional squabble over the "chosen instrument," or community company concept of operation whereby one jointly-owned airline would be granted permission by the government to operate overseas.

Even after three companies were certificated to fly the Atlantic, instead of the two that Smith had believed necessary, Trippe held to his belief and at one time tried to buy TWA. AVIATION WEEK is told that the AOA negotiations were instigated by Trippe. The discussions were held between Smith and Trippe, and so secretly that some top operations executives of AOA did not know they were in progress.

▶**Repercussions**—The AOA deal may have repercussions even after CAB action. The agreement prohibits Pan Am from trying to buy stock of any other company until the sale is consummated. There is reason to believe, however, that PAA feels that this is a first step in buying the single-company U. S. operation over the North Atlantic that it has been unable to gain through legislation or CAB ruling.

For AA's part, Smith, an early advocate of both air freight and air coach service, will be free to concentrate on American's domestic system—at a time when both coach and freight service are beginning to make headway.

Lawrence D. Bell

John Stack

Capt. Chas. E. Yeager

X-1 Project Wins Collier Trophy

Award goes to scientist who studied compressibility, builder of plane, and pilot who passed sonic speed.

The 1947 Collier Trophy has gone to three men representing the sum of the nation's effort in achieving piloted supersonic flight for the first time in history. The winners: Lawrence D. Bell, President, Bell Aircraft Corp., builder of the X-1 research airplane; Capt. Charles E. Yeager, USAF, pilot of the X-1 on its first supersonic flight; and John Stack, NACA, supersonic research scientist, who laid the technical foundation for design of the X-1.

By thus embracing the three principal activities responsible for the historic achievement, the Collier Trophy awards committee has recognized the successful X-1 program as "the greatest achievement in aviation in America, the value of which has been demonstrated by actual use during the preceding year." The first piloted supersonic flight was made by Capt. Yeager on Oct. 14, 1947 at Muroc Air Force Base, Calif., and disclosed in an exclusive AVIATION WEEK story on Dec. 22, 1947.

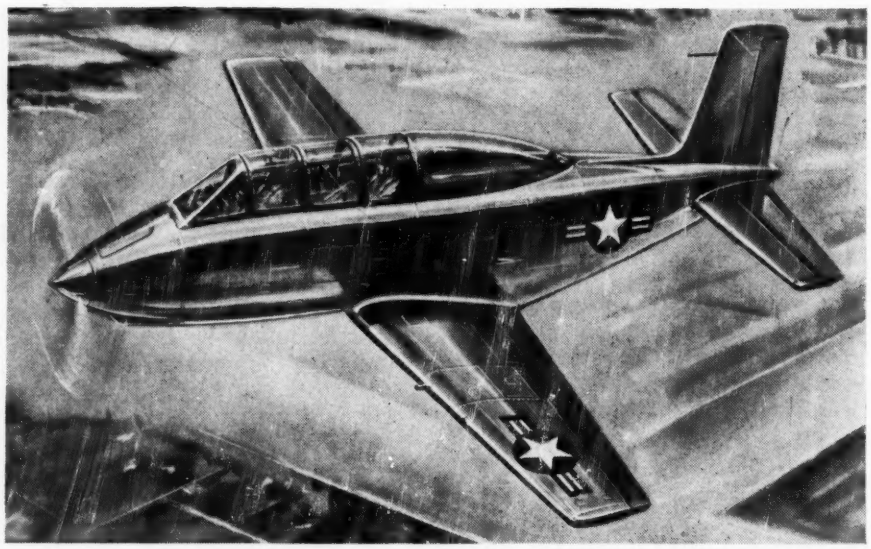
► **Stack's Role**—John Stack's contribution to the supersonic flight program actually had its beginning in 1927 when he was assigned to research on the problem. Stack designed and built the first high speed wind tunnel at the NACA Langley laboratory in 1929 and had developed basic research data on compressibility phenomena and the design of highspeed airfoil sections as early as 1935. By 1938 the principles of supersonic aerodynamics were thoroughly understood and in 1942 it became apparent that all the required knowledge was available for the design of a supersonic piloted airplane.

Stack and Air Force officers began discussions of the problem in the fall of 1943 and in March, 1944 a definite program of piloted sonic and supersonic research had been formulated. In December, 1944, Bell joined the program to provide the detailed design and construction of the X-1. The first airplane was completed at Buffalo late in 1945 and glide tests were carried out in February, 1946, while completion of the rocket power plant was delayed.

► **X-1 Progress**—The engine was finally installed and the first powered flight was made at Muroc Air Force Base, Calif., Dec. 9, 1946. Demonstration flights continued through the spring of 1947 and the airplane was accepted by the Air Force in August. Capt. Yeager took over flight testing of the airplane and attained supersonic speed for the first time Oct. 14. He has since flown at supersonic speeds on numerous occasions.

It was this combination of scientific aeronautical research, aircraft design and construction, and military planning, evaluation and use, that comprised the national effort in attacking the problem of piloted supersonic flight. The 1947 Collier Trophy award recognizes this coordination between three essential activities in producing a single aeronautical achievement.

The Collier Trophy, which is administered by the National Aeronautic Association, was awarded by a committee headed by John F. Victory, executive secretary, national advisory committee for aeronautics. Representatives of every segment of the industry were members of the committee.



XT-30 Mockup Is Completed

Douglas Aircraft Co. has completed the mock-up of its XT-30 trainer at its Santa Monica plant. The mockup was built under an experimental Air Force contract. No prototype construction or production of the plane is planned at this time. Artist's drawing is above.

Design of the XT-30 was submitted in the Air Force trainer competition won by North American's T-28. Principle feature of the XT-30 design is the excellent visibility provided by shifting the Wright R-1300 engine aft of the cockpit and driving the propeller through a shaft running under the cockpit floor. This eliminates the engine bulk in the nose giving the pilot a clear view forward.

The XT-30 was designed for a top speed of 268 mph. at 10,000 ft., and a cruising speed of 190 mph., giving it an endurance of six hr. 15 min. It has a design gross weight of 6000 lb. and a service ceiling of 29,600 ft.

The Douglas trainer has a wingspan of 36 ft. 4 in. with fuselage length of 36 ft. 9 in. It has a tricycle landing gear and tandem seating with dual controls. Craft was intended primarily as a transition trainer for jet pilots.

CAB Would Tighten Nonsked Exemption

The nation's large irregular passenger carriers and their ticket agent allies face another screw-tightening revision of the nonscheduled exemption.

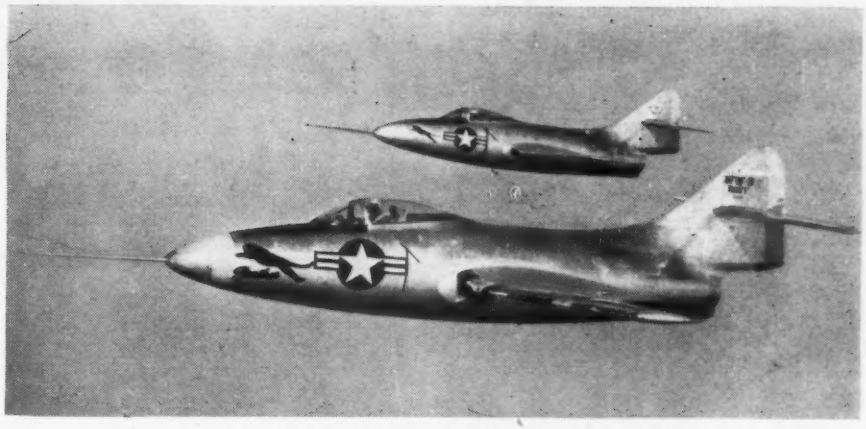
Proposed changes in Section 292.1 of the Economic Regulations circulated for public comment by CAB last week would terminate the general exemption of about 109 large irregular carriers 30 days after the revision became effective. Thereafter, each nonscheduled line using transport-type equipment would be permitted to operate only through an individual exemption.

► **Board's Power Strengthened**—Large irregular carriers asking for individual exemptions within 30 days after the revision is promulgated would be permitted to continue operations under the current blanket exemption until CAB grants or denies the new application. The proposed change in 292.1 would generally strengthen the Board's power to deal more effectively with both large and small nonskeds whose operations become too extensive. The revision emphasizes that a nonscheduled carrier's letter of registration is not a license and confers no privileges beyond those set forth in the regulations.

Coincident with the proposed changes in 292.1, CAB issued a detailed interpretation of what constitutes legitimate irregular service. Nonskeds were advised to study examples prepared by the Board to determine whether they are conducting illegal regular operations.

CAB's latest move seeks to prevent the widespread practice of piecing together individual irregular operations of two or more carriers to make an overall pattern of regularity. Chief mechanism for such practices—the use of a single ticket agency for several carriers—would be brought under close CAB scrutiny.

Large irregular carriers would also be forbidden to establish joint rates with other lines. Comments on the 292.1 revision are due by Jan. 15 and will be considered before CAB takes final action.



CAN YOU TELL WHICH IS WHICH?

Two models of Grumman's new Navy jet fighter, the F9F, are shown in flight. F9F-3 (foreground) is powered by the Allison J-33 jet engine while the F9F-2 (rear) is powered by an imported British Nene engine built by Rolls-Royce. Pratt & Whitney will build the Nenes under license for production model Panthers. Grumman will produce two separate models as designated above since the engines are not interchangeable.

Propulsion Future Outlined in Lecture

A long look into the future of aircraft propulsion, which revealed performance possibilities considered near-impossible under present standards, was provided engineers by the 1948 Wright Brothers Memorial Lecture in Washington, D. C., last week.

The lecture, sponsored annually by the Institute of the Aeronautical Sciences, was delivered by Abe Silverstein, director of wing tunnel and flight research division, NACA Lewis Flight Propulsion Research Laboratory, Cleveland, Ohio.

Unlike reciprocating engine research and development, which grew haphazardously through the years, gas turbine researchers and engineers now have a blueprint to guide them into the future with theoretical possibilities and limitations clearly outlined. Silverstein examined the possibilities of the complete aircraft engine spectrum: compound reciprocating, turboprop, turbojet, ramjet and rocket, and indicated clearly that these engines, with the exception of the reciprocating type, are only at the beginning of what may be called their development life.

Some of the goals of determined research effort:

- Increased compression ratios to 20 or 30, which are five or six times greater than those presently used. This can be accomplished by the use of the supersonic compressor or by combinations of axial-flow and radial-flow compressors in tandem.
- Increased turbine inlet temperatures to 2500-3500 deg. F., or double those in present use. This may be possible through the use of liquid or air-cooled turbine blades in combination with superior heat-resistant turbine blade alloys.
- Increased combustor input to the turbine to as high as 50 million btu/cu. ft. of combustor volume. This is about 17 times the heating energy produced by present combustors. This rise may be produced as a result of the increased compression outlined above and by improving the mixing and burning processes within the combustor.
- Improved heat-resistant materials must be found to accommodate the temperatures mentioned above. The present outlook for metal alloys is gloomy and brightest hope for the future appears to be ceramics and ceramels, ceramics bonded to metal.

USAF Completes Two Nonstop Flights

U. S. Air Force stretched its wings last week, sending a Convair B-36B on an 8200 mile nonstop flight and a Boeing B-50 on a 9400 mile nonstop. Both planes carried normal bomb loads.

The B-50 was refueled in flight three times by special modified Boeing B-29 aerial tankers. The B-36B was not refueled.

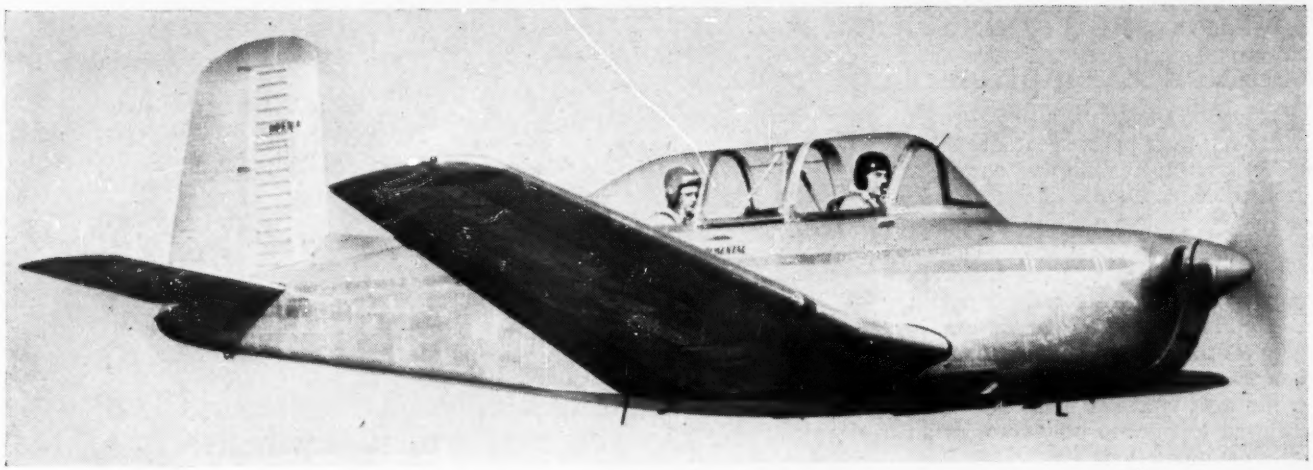
This demonstration of extended bomb range was made as a part of the operational testing program on the two new bomber types by the Strategic Air Command. Air Secretary W. Stuart Symington said the B-50 aerial refueling operation demonstrated that it was now possible for an aircraft to fly nonstop around the world by means of servicing from flying tankers. At the same time USAF revealed that the special striking force of six SAC bomb groups would be equipped with flying tankers for long range operations.

Both bombers penetrated the air defenses of Hawaii without detection by the islands' radar sets.

Top Officials Change At Curtiss-Wright

Curtiss-Wright Corp. has a new president and chairmen of its board of directors and executive committee as a result of top executive changes announced last week.

Guy W. Vaughan, now chairman of the board, is succeeded in the presidency by William C. Jordan. Paul Shields has become chairman of the executive committee, a new post. Jordan also was elected president of Curtiss-Wright's subsidiary, Wright Aeronautical Corp.,



and a director of both of the companies.

▶ **Vacant Since Death**—Chairmanship of the board had been vacant since the death of George Armsby several months ago. Vaughan, who continues as chairman of the board of Wright Aeronautical, has been president of Curtiss-Wright since 1935 and president of the subsidiary since 1930. He has been with the two companies 25 years.

Jordan had been vice president and general manager of Wright Aeronautical, and is a former general manager of the Curtiss-Wright Airplane division.

Shields has been a director of Curtiss-Wright since Nov. 3. He is senior member of Shields & Co., New York investment banking firm specializing in financing of industrial and utility companies. He has been associated with it since its organization in 1922.

The changes were voted when directors of Curtiss-Wright and Wright Aeronautical met in New York. Announcement by Curtiss-Wright, manufacturer of aircraft, engines and propellers, said they had long been under consideration.

Procurement Rule Adds Allowable Cost Items

The three military services have adopted a new section of the procurement regulations, spelling out types of costs allowable in research and development, supply and material, and construction cost type contracts. The section, No. 15, titled "Contract Cost Principles," becomes mandatory Feb. 1.

Four major items not previously allowable in computing contract costs now are permissible: state income taxes; use and occupancy insurance; ordinary local charity and community benefit donations; and charges for depreciation on fully depreciated assets.

Advertising in trade and technical journals also is allowable on research and development, and supply and material cost type contracts.

Beech Model 45: A Military Trainer

Developed from the Bonanza, tandem training craft is aimed mainly at off-shelf U. S. and foreign purchases.

A new Beech tandem trainer airplane developed for military sales from the four-place Beechcraft Bonanza business plane, has made its first test flights at Wichita and soon will tour the country for demonstrations to military personnel.

Walter H. Beech, president, said the new plane, the Model 45 Mentor, while not developed with government money, meets all of the latest Air Force specifications.

It is aimed at off-the-shelf purchases by this country and foreign governments.

▶ **Same Tooling**—High volume production tooling developed for the Bonanza can be used for most components of the new Model 45. It is believed that the company can go rapidly into high volume production of the trainer if orders are placed.

Plane resembles the low-wing, tricycle-gear Bonanza except for a tandem seating arrangement with conventional trainer sliding canopy, and a conventional single tailfin, replacing the veetail arrangement of the Bonanza. Powerplant is a Continental 185.

Beech says design philosophy behind the Mentor is to provide a plane with the strength factor of a primary trainer plus performance factors of a basic trainer, and also to provide an aircraft which can be operated and maintained at low cost.

▶ **Load Factor 10**—Model 45, according to statement by company officials, has ultimate load factor of 10 for maneuvers and ultimate landing load factor of 6.67.

Performance data listed includes maximum permissible dive speed (indicated) 280 mph.; top speed (true) 176 mph. at sea level; normal cruising speed (true) 160 mph. at 10,000 ft. with 61 percent power; landing speed (true) with flaps 56 mph.; climb first minute 925 ft.; service ceiling 18,000 ft.; fuel consumption 10 gal./hr,; range at cruising 634 miles; takeoff over 50 ft. obstacle zero wind sea level, sod runway, 1300 ft.; landing over 50 ft. obstacle same conditions 750 ft.

Manufacturer states the trainer can be delivered in quantities for approximately $20,000 per unit, or about half the price of any trainer of comparable performance now available.

Comparison of operating cost of the model 45 Mentor with that of two trainer planes widely used in World War II, the North American AT-6 and the Consolidated-Vultee BT-13, as quoted by Beech, shows the following savings would result by use of the Mentor over a five year period:

- As compared with the BT-13, a saving of approximately 97,500 gal. fuel and a saving of $4750 in engine maintenance.
- As compared with the AT-6, a saving of 150,000 gal. fuel and a saving of $9750 over the North American in engine maintenance.

Beech points to interchangeability of many parts between Model 45 Mentor and the Model A35 Bonanza. This gives new trainer advantage of an increased factory production of spare parts and availability of parts replacement and service at authorized commercial Beechcraft supply and service stations across the country.

Vern Carstens, chief Beech test pilot, reported after his first flight that the plane was very stable directionally, laterally, and longitudinally, and had "performance and characteristics to make it a good trainer."

TEMCO Busy On Airlift Overhaul

Dallas plant currently processes 50 C-54s in what amounts to more than $1 million monthly business.

C-54s for the Berlin airlift come and go on a new schedule of 25-in, 25-out a month at the TEMCO plant in Dallas, Texas.

Working over the C-54s, choked with coal dust or flour dust and otherwise beaten up from the grueling freight runs into the Soviet-blockaded metropolis, is the foremost current activity at TEMCO's sprawling 1,229,500 sq. ft. plant on the western outskirts of Dallas. An unofficial estimate is that it's better than a million-dollar-a-month job.

▶ **Overhaul Routine**—Flown to Dallas from Germany via Westover Field, Mass., a C-54 enters on a cycle-overhaul routine that will keep it there from about three to four weeks before a ferry crew shoots back to Europe with it for its next 1000 hr. of punishment.

About one in five of the aircraft will require a complete reseal job on the tank, the biggest single overhaul job on the C-54. This alone requires some 3000 man-hours of work.

It means relining with thycol synthetic material a wing tip-to-wing tip 3600-gallon fuel tank which is essentially the internal structure of the C-54.

Partial, or total, rebuilding of floors, including "beefing up" of floor beams, is another major item in the overhaul picture, especially since heavy loading, if not outright overloading, falls to the lot of the airlift craft at the hands of men urgently pressed to deliver the goods to Berlin in the cold war.

C-54s arrive at TEMCO in a condition described as ranging from "fair" to that of "old dogs."

▶ **Different Conditions**—Sometimes a plane with 8000 hr. will show up in relatively fair shape while, surprisingly, a 3000 hr. craft will be an old dog, with corroded skins, bell frames, bracket assemblies, etc. This is attributed to variations in individual care, localities of service and circumstances of operating conditions. Then too, when the airlift started, aircraft were needed in a hurry. C-54s went to Germany from various Air Force theaters in contrasting conditions, further accounting for extreme variations in their shape when they arrive for overhaul.

At TEMCO, the overhaul cycle goes from 1000 to 8000 hr., with a plane due for working-over after each 1000 hr. At 8000, it gets a major overhaul, and starts out again at zero.

▶ **Master Change Requests**—What the Army calls "master change requests" are also going into the planes. M.C.R.s include extra equipment for blind flying, items for fire prevention, and, most important right now, a winterization program. Winterization entails installation of short-cord deicer boots, change of seals in hydraulic units, change of fuel, oil and hydraulic hoses and reworks in landing gears.

Spare parts are a headache in the overhaul picture. TEMCO finds it necessary to make many in its own shops. Scarce items include engine "dishpans" (bell cowls), raw stock like special C-54 screws and bolts, spare landing gears, spare wings, spare hydraulic units and also spare R-2000-9 engines.

TEMCO finds it necessary to make floors, skins, bell frames, and various large fittings. They make oil lines, gas lines, instrument panels and parts for repairs.

▶ **Step Up**—At TEMCO, the C-54 program has gone from an initial flat Air Force order placed last May on 45 planes to be overhauled at a cost of about $2,500,000 to the present program of 25 planes a month to continue indefinitely at a cost not disclosed. Actual work has progressed from six planes monthly early last summer to 15 in October, to 20 in November. The plant employs 3000 workers, part of the force also working on other aircraft conversion (including a Chinese fighter plane order) and miscellaneous products (tractors, truck bodies, popcorn machines).

TEMCO claims to be handling one-half of all the C-54s being reconditioned for the Air Force, with Lockheed Aircraft Service and Transocean Airlines splitting the balance.

When a C-54 is overhauled, it goes into flight operations at the plant, then is flown and accepted by the Air Forces; then moves into a restricted area under guard until crews pick it up. The stop at Westover Field on the outward flight may be only a few hours before they're off for Germany to put the much-needed plane into service again.

Unions Can't Decide On Boeing Workers

Boeing Airplane Co. is marking time since appealing to the U. S. Court of Appeals in Washington, D. C., a National Labor Relations Board's ruling that it must bargain with the Aeronautical Mechanics Union. But on the union side it's a different matter. AMU and the Teamsters Union still are locked in a quiet struggle to see which will represent Boeing workers.

Although the NLRB decision would seem to give a definite advantage to AMU, the Teamsters show no signs of withdrawing from organizing efforts it began during the six-month strike which ended in September. AMU claims 10,000 members, conceding about 5000 to the Teamsters (of a total payroll of about 22,500). The jurisdictional war could end quickly.

At about the same time NLRB ordered Boeing to bargain with AMU—giving that union the top position in the inter-union battle—American Federation of Labor president William Green announced that conferences would be held soon with representatives of the International Association of Machinists (AMU's parent union) looking toward

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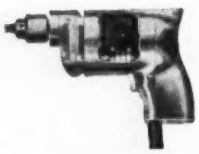

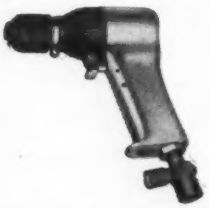

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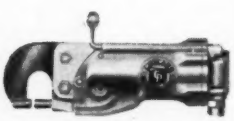

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reaffiliation of IAM's 650,000 members.

IAM left A. F. of L. in 1946, climaxing a 34-year dispute with the Carpenters' Union over installing plant machinery. Reaffiliation would take the steam out of the efforts of Dave Beck and his A. F. of L. Teamsters to take over bargaining rights for the approximately 14,800 production workers represented by IAM. when the strike began April 22.

► **Direct Conflict**—The Teamsters set up a new Seattle local, 451, Warehousemen and Aeronautical Workers Union, purposely to organize Boeing, thus entering into a direct jurisdictional conflict with IAM. Beck at that time said his plans at Boeing would change "only if the Aero Mechanics returned to A. F. of L." (AVIATION WEEK, Sept. 20).

The Teamsters are going ahead with their organizing drive, with A. F. of L. organizer John Sweeney assigned the job. The Teamsters now claim to have almost as many members at Boeing as the Aero Mechanics. When the NLRB decision was still pending, Sweeney said he would continue his efforts even if NLRB upheld the Aero Mechanics. But if IAM rejoins A. F. of L., the picture might change.

PRODUCTION BRIEFING

Irving Air Chute Co., Buffalo, N. Y., is completing work on a $135,000 French order for 793 parachutes.

Pratt & Whitney Aircraft division of United Aircraft Corp. reports that it has produced more than 77 percent of all power-plants installed in U. S. commercial transports operated by scheduled domestic airlines.

Marquardt Aircraft Co. is moving into new quarters adjacent to the Metropolitan Airport, Van Nuys, Calif. It will take about six months to complete transfer from existing plant at Venice, Calif. Company plans to increase employment from about 100 to 400 next year to fulfill backlog of approximately $2.5 million.

Thompson Aircraft Tire Corp., San Francisco, has received an Air Force contract totaling $200,000 for retreading airplane tires, some of which have been used by the Air Force on the Berlin airlift.

Hycon Mfg. Corp., Pasadena, Calif., has been bought by Millard H. Pryor, president, Pryor Mfg. Co. and Barnes Mfg. Co., Mansfield, Ohio. Hycon specializes in manufacture of aircraft hydraulics components.

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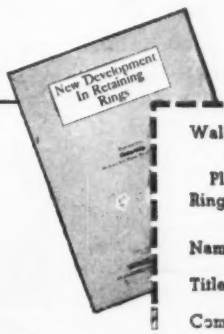

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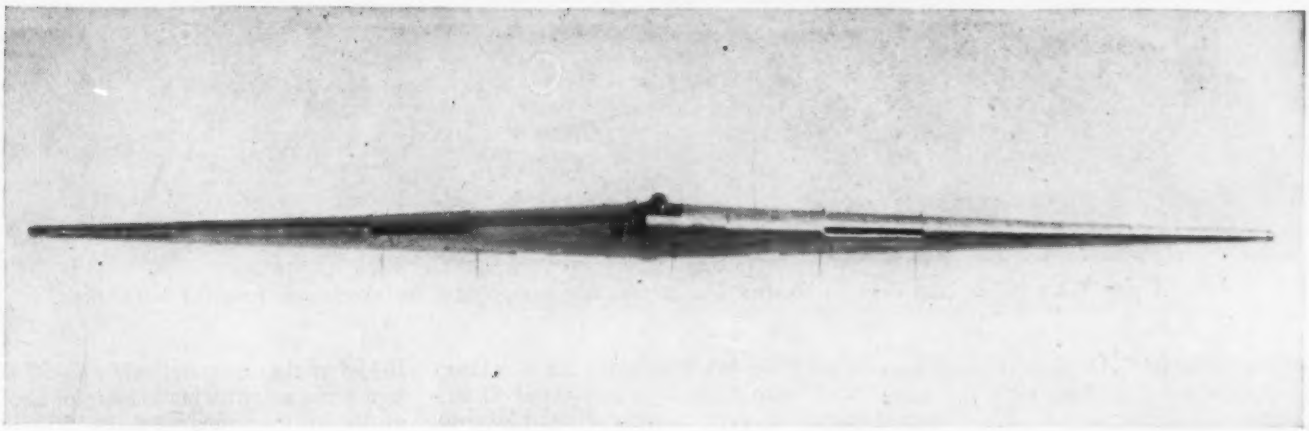


Low-Drag Accented In All-Wing

Configuration slashes parasite resistance to boost performance, but problems of stability and control are not yet fully solved.

By Robert McLarren

The all-wing airplane is a logical evolution of the flying machine. The history of aeronautical science has been, largely, a 40-yr. struggle to reduce the airplane's parasite drag.

From the original Wright Brothers plane of 1903, aerodynamics progressed to the enclosed fuselage, single-bay interplane strut arrangement, reduction of the biplane to the high-wing monoplane, introduction of the low-wing monoplane, retractable landing gear, NACA engine cowl, full cantilever structure and all-metal monocoque construction.

And now has come the elimination of the tail surfaces and fuselage, leaving merely the wing.

It would seem that this configuration typifies its evolution of form for apparently we can go no further in this direction.

► **Configuration Details**—So the all-wing plane does not represent a new and "radical" type of aircraft from a consideration of form, for it is the configuration for which we have been striving for four decades.

However, since tail surfaces have, throughout the years, comprised the principal source of aircraft stability and control, their removal has created a new and interesting aerodynamic problem. It is important, therefore, to bear in mind these two separate and distinct factors in an appraisal of all-wing aircraft.

It is equally important to distinguish between the all-wing and the tailless airplane. Planes of the latter type have been flown successfully almost since the time of the Wright Brothers.

Space does not permit even a brief description of the long list of tailless aircraft, but without exception all of these scores of planes featured one or more *vertical* surfaces somewhere in their configuration. The tailless airplane, then, is an aircraft without a "tailplane", as the British call it.

The unique contribution of John Knudsen Northrop to aeronautics is the complete elimination of vertical surfaces and the creation of a true *all-wing* aircraft.

Actually, he has not yet reached his ultimate goal of a smooth exterior surface without excrescences of any sort, for Northrop Flying Wing types flown to date have included canopies, propeller shafts, gun turrets and other exterior shapes through practical necessity.

A glider version of the Northrop XP-79 fighter housing a prone pilot closely approached the ideal all-wing craft, however, with the original configuration displaying only a slight bulging of the wing leading edge at the center to accommodate the pilot enclosure.

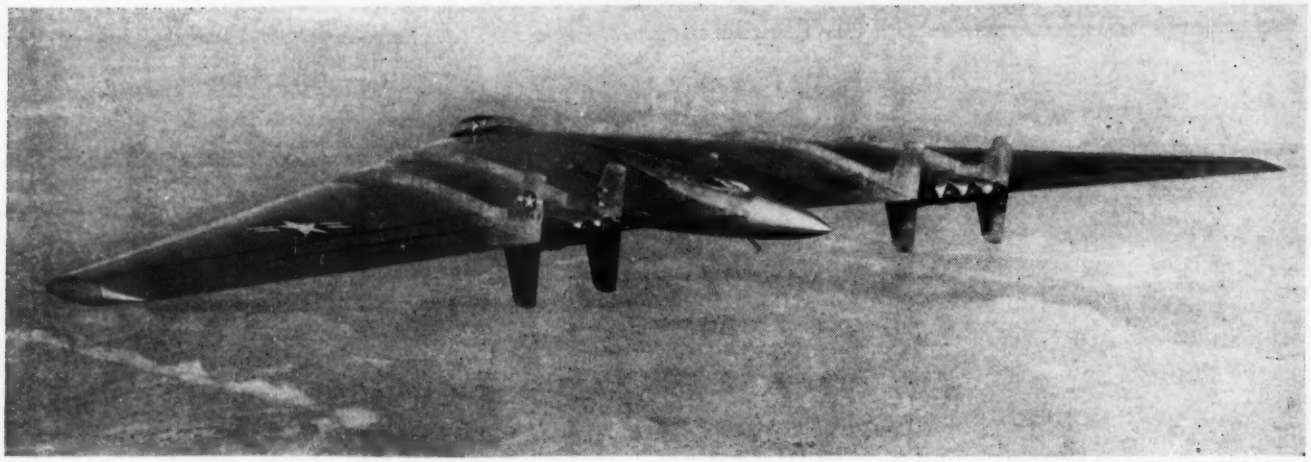
► **Drag Reduction**—Basic superiority of the all-wing over conventional types is its elimination of the parasite drag produced by fuselage and empennage. Average minimum drag coefficient of several large, modern aircraft, such as the Boeing B-29, Convair B-24, Douglas C-54, is 0.023, whereas the minimum drag coefficient of several Northrop Flying Wings varies from 0.010 to 0.0113, the latter representing the B-35 bomber. Northrop has actually achieved the long-sought "double-0" (0.00n) minimum drag coefficient on some designs in model form.

Therefore, the all-wing craft exhibits a minimum drag coefficient more than 50 percent below that of conventional planes. It is this inherent ability of the all-wing configuration to slash parasite drag in half that is its foremost performance advantage.

Unfortunately, however, this parasite or "form" drag is only a part of its total drag, remainder being made up of induced drag, a resistance created as a result of the lift of the wing. But at high speed (low lift), the parasite drag is as high as 80 percent of the total drag, and since the all-wing has only half the average value of parasite drag, it will have only 60 percent as much total drag as the conventional plane.

This means, simply, that the all-wing plane requires only 60 percent of the power required by a conventional type to reach the same high speed.

Since power required varies as the cube of the velocity, the all-wing will fly



Latest Flying Wing is Northrop B-49 jet bomber. Use of four fins compensates for absence of propeller installations.

$(1/\sqrt[3]{.60} = 1.18)$ 18 percent faster than a conventional airplane with the same power.

▶ **Range Improved**—At low speeds, such as cruising, which require a considerably higher lift coefficient, the proportion of parasite to total drag is substantially less.

Maximum range, according to Breguet's law, is attained when parasite and induced drag are equal. Thus, if parasite drag is 50 percent of the total drag and the all-wing has 50 percent less parasite drag, then its total drag is only 75 percent that of a conventional airplane at the cruising speed of the latter.

This means that the all-wing aircraft can cruise at only 75 percent of the power required by the conventional plane at the same speed. Since range varies directly as power required, the all-wing can fly one-third farther (1/.75) than the conventional plane with the same amount of fuel.

If the all-wing craft is permitted to cruise at a higher speed in which its low parasite drag constitutes a greater portion of the total drag, then it can fly over 40 percent farther than the conventional plane with the same amount of fuel.

▶ **Structure Efficient**—Because tail surfaces and fuselage are eliminated from the all-wing, their weight, cost and fabrication time are eliminated, resulting in substantial savings in all three factors.

Weight of the fuselage and tail surfaces of a conventional airplane the size of the Northrop B-35 would be 12-16,000 lb. This is a net saving that can be applied to useful load in an all-wing type having the same wing loading as the equivalent conventional aircraft.

One of the importance indices to airplane "efficiency" is the ratio of useful load to gross weight, which gives the percentage of total weight carried in useful load. Engineers have long held a figure of 50 percent as a goal in structural design and most present-day aircraft have a figure of 30-40 percent.

Because of its great saving in fuselage and tail surface weight, the Northrop B-35 empty weight is only about 40 percent of its maximum allowable gross weight, giving a figure of 60 percent useful load.

And, because loads are carried within the wing itself, the structure can be built lighter and more efficient since more even load-distribution can be achieved throughout the wing area, rather than concentrated largely in the fuselage of a conventional type.

▶ **Wing Alone Stable**—While it is apparent from the previous discussion that the all-wing aircraft possesses vastly superior performance characteristics over the conventional plane because of its substantial reduction in parasite drag, removal of the tail as the primary source of stability and control creates extensive problems.

It has long been known that a wing utilizing either a symmetrical airfoil or a section incorporating reflex camber at the trailing edge and with dihedral, possesses all the aerodynamic characteristics necessary for both longitudinal and lateral stability. Thus, an all-wing plane using a straight wing can be built and flown successfully.

To provide a trimming control, a segment of the wing trailing edge is hinged to act as an elevator. This introduces one of the major drawbacks to the all-wing design, however, for movement of this surface changes the camber of the attached airfoil, hence affects the wing's lift, drag and pitching moment.

When this surface is moved up, it reduces wing camber, and, therefore, the wing lift. This lift loss reduces the wing's maximum lift coefficient from 20 to 40 percent, resulting in takeoff, landing and stalling speeds substantially higher than with conventional craft.

▶ **Wing Area Added**—Because of this reduction in maximum lift coefficient, the all-wing type must incorporate more wing area for a given gross weight than in a conventional aircraft.

As a result, for example, the Northrop B-35 has the comparatively modest design gross weight wing loading of about 40 lb./sq. ft. compared with 75 lb./sq. ft. of the wartime Boeing B-29. Wing loadings as high as 100 lb./sq. ft. have been attained in some conventional designs.

While this comparatively light wing loading has several important advantages, particularly with respect to rate-of-climb and ceiling, the additional wing area produced drag which penalizes the all-wing in obtaining its maximum efficiency.

While the Northrop Flying Wing attains a maximum lift coefficient of only 1.5, the average of several large conventional aircraft is 2.3—a 35 percent deficiency for the all-wing type.

As a result, the all-wing, to attain the same landing speed of a conventional design of same size, must land at 35 percent less weight.

▶ **Low Landing Weight**—This deficiency is experienced only under conditions requiring the use of the maximum lift coefficient, such as takeoff, landing and stall. With the trailing edge control neutral, the all-wing aircraft possesses all of the advantages previously outlined.

It has become customary to placard heavy aircraft with two weights—maximum gross for flying and a maximum permissible landing weight, the latter some 10-20 percent less than the former. Since maximum permissible landing weight in the all-wing is 35 percent less than flight weight, it actually is only about 20 percent worse off than the average conventional heavy aircraft.

To reduce this loss of lift associated with deflection of the wing trailing edge, wing sweepback has been used, and it is this simple change in planform that has created the majority of the longitudinal stability difficulties of the type.

There are numerous reasons why sweepback is an effective solution to all-wing design problems.

▶ **Advantages of Sweep**—For an aircraft to be longitudinally stable, the center of

gravity must be forward of the wing aerodynamic center since the wing alone has a positive pitching moment.

By placing the c.g. forward of this point, a negative pitching moment is created which tends to equate the wing positive pitching moment.

On most airfoil sections, this aerodynamic center is located at about the quarter-chord point aft of leading edge. With a straight wing, this would require that all of the weight be concentrated in the forward 25 percent of the wing, leaving a large part of the rear 75 percent as useless space.

By sweeping back the wing, the mean aerodynamic chord can be shifted rearward any desired amount and the aerodynamic center located rearward accordingly. This configuration then provides substantial area forward of the aerodynamic center in which to place the airplane load items.

Second advantage of sweepback is that wing tip areas are a substantial distance aft of the airplane c.g., so that control surfaces placed in these regions possess an effective "tail length," their load times this distance producing the required trimming moments.

As a result, their size may be reduced to practical values and only a minor change in lift on the control surface will be required to produce the desired pitching moment.

Third advantage is that sweepback permits use of high-lift trailing edge flaps along the center-section. Undesirable pitching moments created by flap deflection are thereby minimized since moment arm aft of the c.g. is comparatively short.

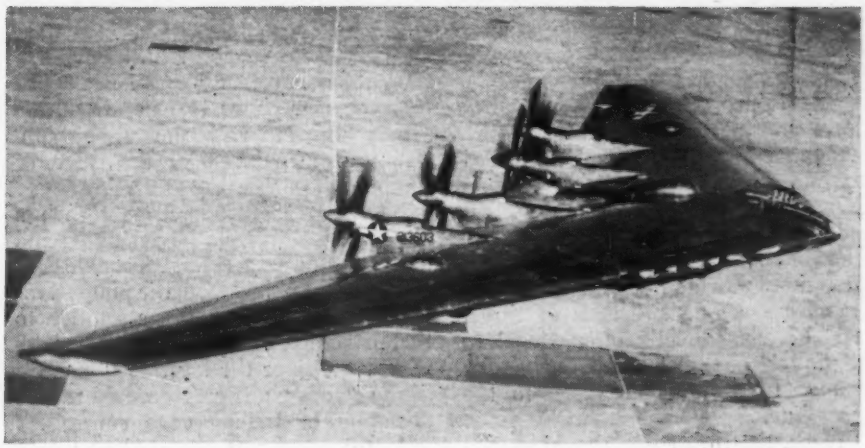
Actually, if sufficient sweepback is used, flap deflection can provide a desirable pitching moment and thus be used as an elevator since the centroid of its load could be located forward of the c.g.

► **Sweep Disadvantages**—Major disadvantage of sweepback is its creation of spanwise flow. This difficulty constitutes the main stability problem of the all-wing craft.

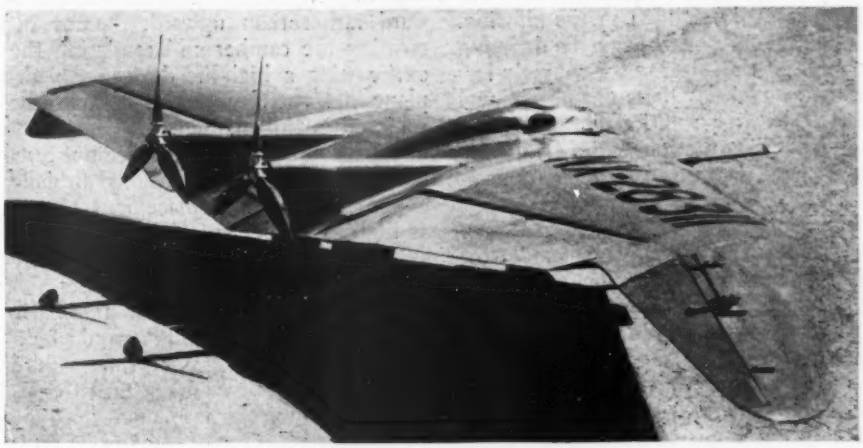
The phenomenon is created by the progressively rearward location of the minimum pressure point on adjacent span segments. Thus, at any point on a wing chord there exists a region of lower pressure adjacent to it in the direction of the tip.

Since air tends to flow from a region of higher to one of lower pressure, a tipward drift of the wing boundary layer is produced. Since this drift increases the pressure over the wing upper surface and thus reduces lift in the tip area, the tip will stall first, as a result of its thickened boundary layer—the stall progressing inboard as angle of attack is increased.

There are several solutions to the problem of tip stalling, most of which have been tried in various conventional planes with moderate sweepback.



Northrop Flying Wing B-35 bomber dwarfed previously built versions of all-wing craft.



Earlier version of Northrop all-wing aircraft was this N1-M.

Wing twist is one of the simplest and most effective methods. This has been used in the Northrop Flying Wing. Since the tip stalls at a lower angle of attack than does the inboard region of the wing, the area in the vicinity of the tip is given a wash-out (lower angle of incidence with respect to horizontal reference line).

This system cannot be used to excess, however, because it creates serious drag rises when the wing as a whole is flown at high speed (low lift coefficient). Since the inboard portions of the wing will be flying at low or zero angle of attack, the tip region will be flying at a negative angle of attack, with attendent high drag.

► **Slots Used**—Most serious effect of premature tip stalling is that control surfaces are located along the trailing edge of the tip region and their effectiveness is lost just when needed most.

A second solution to the problem is use of slots near the leading edge or a slat at the leading edge.

Properly designed slots can increase the stalling angle of the tip region as much as 10 deg. but their effectiveness hinges on extending them well inboard of the tip (30-50 percent span). Drag of slots and slats in the high-speed condition has been a major objection but this can be overcome by the use of retractable or sealed devices.

The Northrop Flying Wing also uses slots near the tip, which are sealed in high-speed condition and opened for low speed flight.

A third method employs flat plate separators, or air "dams" located about halfway out on the wing.

To be effective, these surfaces must extend completely around the wing trailing edge and forward almost to the leading edge.

They prevent spanwise flow of boundary layer in mechanical fashion by erecting a physical barrier to its movement.

The Northrop B-49 Flying Wing also uses this method, with a separator located on either side of the turbojet banks.

Drawback to use of these surfaces, however, is the tendency to create a new stalled region inboard of the plate itself.

► **C.G. Control**—So long as c.g. remains ahead of the aerodynamic center, the all-wing will be statically stable longitudinally. Location of c.g. is controlled fairly easily in the design stage through proper location of load items.

Particular attention must be paid to location of fuel and oil tanks and bomb

bays, since weight of these items change during flight. A complete bomb salvo must not create more than a minor change in c.g., and fuel tanks must be emptied in prescribed order so that balance is not affected seriously.

Aerodynamic center is not controlled so easily, since variations in power, flap-setting and lift coefficient create shifts in this important factor.

Power effects on all-wing stability are not serious provided certain basic conditions are satisfied. Effects of thrust on stability is directly proportional to the product of thrust and perpendicular distance from the plane's c.g. to the thrust line.

Hence, the thrust line should pass as close as possible to the airplane c.g. With buried power plants, this condition is easily satisfied in the all-wing.

▶ **Gust Stability**—Although the damping in pitch of the all-wing is extremely low (as little as 1/10 that of conventional craft), the free rotations in pitch are coupled with motions normal to the chord, and damping of the motions is nearly as great as that provided by the conventional airplane tail. These motions are a result of the small radius of gyration in pitch of the all-wing type.

This situation also provides the all-wing plane with a definite advantage in gusty air. Since c.g. is ahead of the aerodynamic center, the gust reduces the angle of attack and the negative pitching moment tends to alleviate the effect of the gust.

In the case of the Northrop Flying Wing, pilots report that this gust alleviation is actually "too good" and that the huge bombers have a tendency to "dip into" the gust.

The plane comes out of the gust with the nose pointing down, and up elevon is required to return it to steady level flight, resulting in extra work for the pilot in gusty air.

This condition can only be corrected by a reduction in static margin, which would create a "cure" worse than the cause since low static margin would impair longitudinal stability.

Does Not Tumble—One of the unfounded criticisms against the all-wing is a supposed tendency to "tumble," a continuous pitching rotation about the lateral axis.

Actually, there has not yet been a single authenticated instance of all-wing planes—either actual aircraft or models—tumbling from a flight attitude.

Models have been made to tumble in spin tunnels by inserting them into the upflowing stream in a tumbling attitude, such as trailing edge down to the stream. However, neither actual nor model all-wings have tumbled from a stall, spin or other equally violent maneuver, and a whip stall is hardly a maneuver to be attempted by a test or service pilot in a 100-ton bomber.

These tumbling characteristics are obtained only when a positive static margin (c.g. ahead of a.c.) is maintained in the airplane. When the c.g. is allowed to coincide with or to pass aft of the aerodynamic center, serious pitching instability is introduced and the danger of tumbling becomes very great.

Northrop has proposed that such a negative static margin be permitted and the resulting longitudinal instability be accommodated by automatic pilots. This daring proposal is made as a solution to the maximum lift problem of the all-wing type, since the location of c.g. aft of the aerodynamic center would reverse operation of trailing edge controls.

In this condition, the airplane would trim at a high angle of attack with the flaps or elevator surfaces deflected downward rather than upward, thereby increasing the camber and rendering the entire wing a high-lift device. An airplane lift coefficient of 2.0 could be achieved in this manner.

Northrop has actually carried out tests of this system on a conventional airplane and found that a displacement of c.g. as high as 10 percent chord aft of the aerodynamic center did not adversely affect the handling characteristics.

But a dual installation of automatic pilots of absolute reliability would be a necessity for such a system, since failure of automatic pilot could result in complete instability of the plane.

▶ **Fins Needed**—One of the unsolved all-wing problems is directional stability, the one characteristic which demands an external surface *if the same flying qualities as the conventional plane are to be attained.*

Tailless aircraft have, through the years, solved this problem by the location of vertical surfaces somewhere on the airplane.

In his 30-yr. quest for the true all-wing aircraft, Northrop has approached quite closely to the goal but it is this last remaining obstacle that must be overcome.

Use of wing sweepback provides some weathercock stability but not enough for satisfactory handling characteristics.

In the B-35 bomber, the propeller drive shaft housings and side force of the props provided most of the required effective fin area.

In the B-49 jet bomber, absence of the propellers was compensated by use of four fins.

Lack of vertical surface on the all-wing aircraft presents certain difficulties in side-slip because it is difficult for pilot to judge when side-slip is taking place. To provide this "feel" for pilot, a side-slip meter may be installed to afford indication to him or to the automatic pilot.

However, this lack of side force is an advantage in the case of asymmetric power since the lack of lateral area prohibits the increase in drag usually associated with yawed flight.

On the other hand, side force is essential for formation keeping, steadiness in bombing runs and for accurate gunnery. And these considerations may yet make necessary the provision of vertical surfaces either at the tips, along the semi-span or near the center section.

Dihedral in the all-wing craft must be kept very small in the interest of lateral control and steadiness in gusty air. With a sweptback wing, the effective dihedral angle increases with angle of attack, becoming excessive at high angles. Thus, a geometric dihedral angle of zero produces an effective angle of 4 or 5 deg. at a high angle of attack.

For ease of flight a slightly positive effective dihedral is required, whereas dynamic stability of the plane demands zero or negative dihedral.

Northrop uses about 2 deg. positive geometric dihedral and thus ensures positive effective dihedral throughout the flight range.

▶ **Aileron Problem**—Control of the all-wing represents one of its most complex problems because the long moment arm of the tail on a conventional plane is lacking and since trailing edge surfaces produce changes in the aerodynamic characteristics of the wing itself.

Longitudinal control of the all-wing craft through use of hinged flaps on the trailing edge is complicated because the airflow separates from upper surface of the wing near the trailing edge, creating "up-floating" tendencies for the flap.

The problem is further complicated because the elevator of an all-wing aircraft must be deflected through a greater range, must operate over a wider range of wing attack angles and, therefore, must be balanced over a larger range of angles of attack and deflection.

Several solutions to the problem of elevator balance have been proposed, including beveled trailing edge, sealed type with leading edge vent, slots ahead of the elevator, automatically controlled tabs and spoilers, but none have proved wholly satisfactory.

These up-floating tendencies create heavy control column loads and, aggravated by wing high angles of attack, can actually create control force reversal.

For the present, Northrop's solution is the use of irreversible full power-driven control surfaces, which hold the elevator surface in place until deflection is required.

▶ **Takeoff Slow**—One of the serious problems of all-wing aircraft elevator control is the requirement that it provide enough pitching moment to "unstick" the nose wheel of the airplane on takeoff. The Air Force requires that the elevator shall be strong enough to pull the nose wheel off the ground at 80 percent takeoff speed over a runway with a friction coefficient of 0.10.

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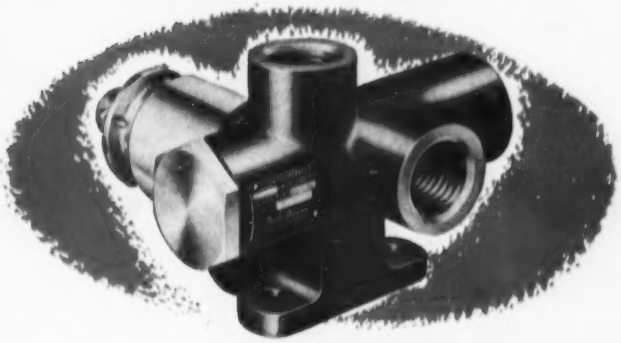

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Making use of a dependable hydraulic pilot actuator to achieve these advantages, Bendix-Pacific valves can be operated continuously without overheating and eliminate the need for holding contacts.

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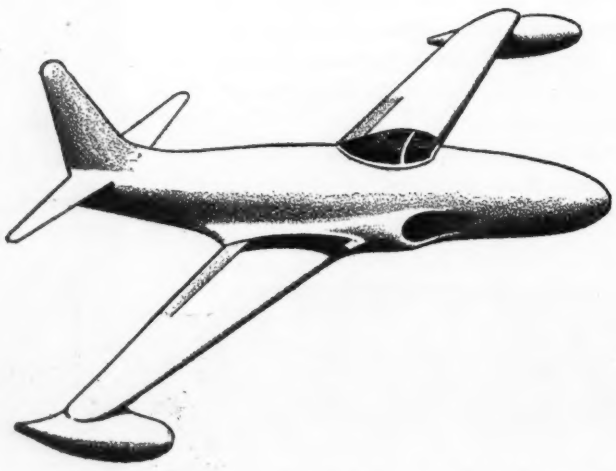

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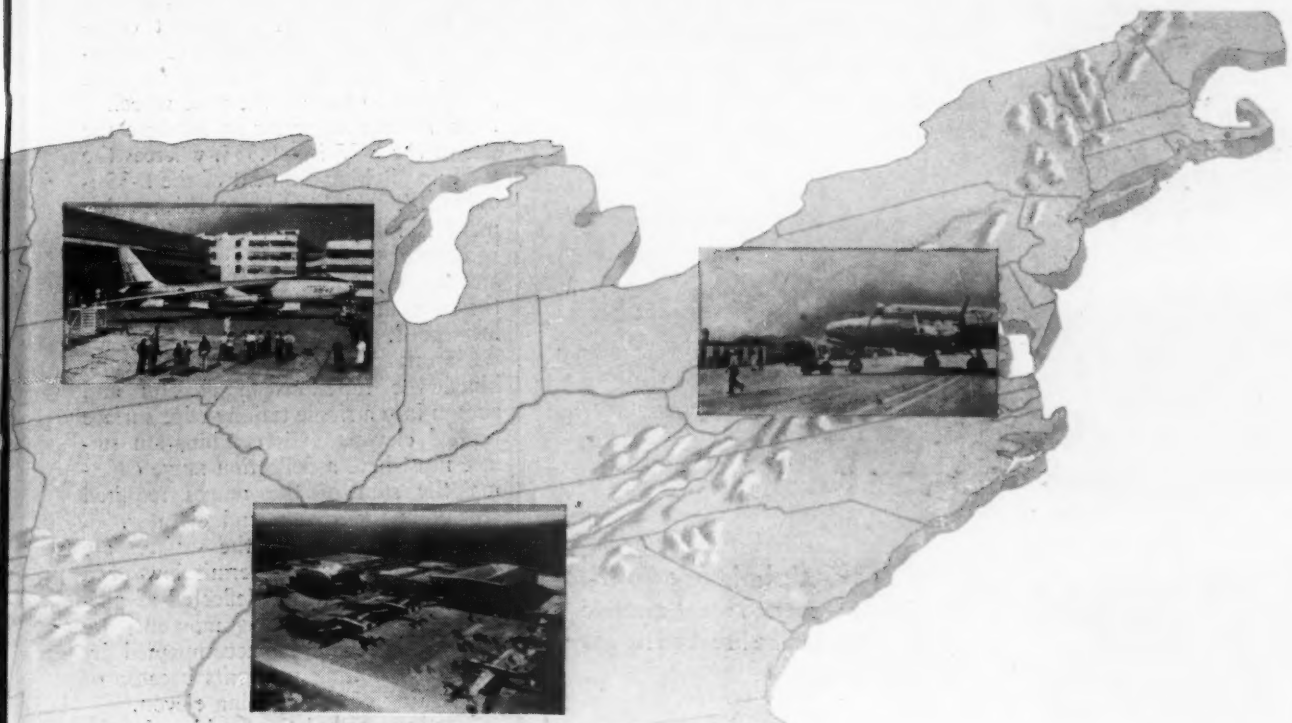

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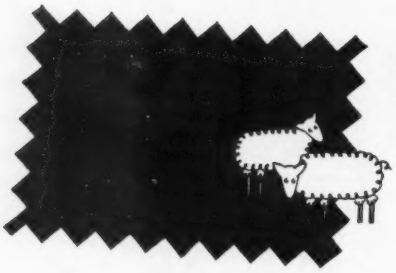

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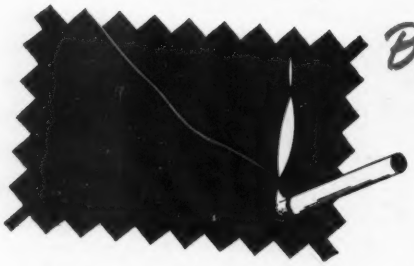

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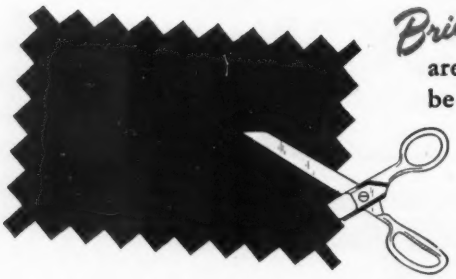

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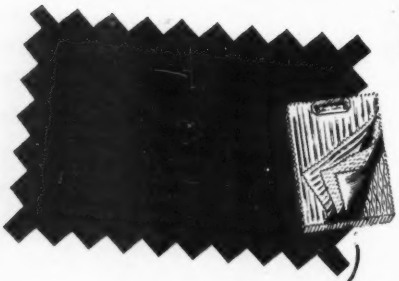

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This means that in addition to providing enough pitching moment to trim the wing at the lift coefficient corresponding to the ground angle of the airplane, an additional pitching moment is required to unstick the nose wheel.

An average value for an airplane the size of the B-35 is —0.335, whereas the total up pitching moment of the B-35 is only 0.15. Inability to meet this requirement is inherent in the all-wing craft because of the extremely short moment arm available to the elevator control and the small amount of load it develops at low speed.

► **Elevons Used**—Northrop has combined the functions of elevator and aileron into a single trailing edge surface termed elevon. This combination surface must have a deflection range covering the sum of the ranges required separately for aileron and elevator.

For example, when the surfaces are raised as elevators to permit low-speed flight and are further deflected as ailerons, very large pitching moments are created that may be accompanied by only small rolling moments because of the stalling of the upgoing elevon.

Northrop solved this problem by the use of a "trim flap," a moving segment of the wing located just forward of the rudders. This is used to supply most of the trim at low speeds, thereby minimizing the upward deflection of the elevons and permitting them to be deflected over a greater range as ailerons.

► **Weathercock Low**—Directional control of the Northrop Flying Wing is obtained by drag rudders located at the tips. These are split flaps opening both up and down simultaneously.

Since they operate in regions of turbulent air, effectiveness is low at small deflections. Mounting of these rudders on the trim flap also causes rudder deflection to create undesirable rolling moments when the trim flap is deflected.

Actually, however, the rudder is little used on the Flying Wing since normal turns are made with elevons alone.

Lack of tail surfaces causes the all-wing to possess extremely low lateral damping characteristics. Combination of low weathercock stability and high effective dihedral renders the all-wing craft susceptible to "Dutch Roll" oscillations.

However, low weathercock stability makes the period of the oscillation comparatively long so that rudder control can be used to effect recovery.

However, if rudder control is weak, the rudder's time of response may be the same as the period of the motion, rendering recovery extremely marginal.

► **Flap Design**—Location and design of landing flaps on an all-wing craft has proved one of the most difficult of its design problems. Use of sweepback has minimized the problem, since the flaps may be mounted on the inboard portion

of the wing, as in the Northrop Flying Wing, where the pitching moment is reduced because of the short moment arm.

The split flap is desirable because of the relatively small pitching moment increment accompanying the production of a given lift increment. This effect can be further improved by moving the flap hinge-line position forward, since this also moves the centroid of the flap load forward along the wing chord nearer to the aerodynamic center of the wing.

However, proper flap design minimizes, but does not eliminate, the undesirable pitching moment, and this adverse affect is absorbed in the all-wing craft in the form of limited center of gravity travel.

In the B-35 this limit is only 6 percent of the mean aerodynamic chord compared to 10-12 percent in conventional aircraft. While this imposes an aerodynamic limitation, its practical disadvantages are minimized by the fact that the sweepback produces a greater mean aerodynamic chord so that actual inches of travel are comparable.

In addition, load items may be distributed over a comparatively great area spanwise within these limits as compared to the conventional plane.

▶**Spin Satisfactory**—Steady-spin characteristics of all-wing are essentially the same as in conventional craft, contrary to ill-founded rumors.

However, recovery from the spin is considerably different than with conventional aircraft. The B-35 will continue to spin with the rudders against the spin and the conventional aircraft recovery method of reversing the rudder and then moving the stick forward will not effect recovery on the all-wing aircraft.

All-wing spin recovery is made with elevons used as ailerons, as follows: The rudders are kept with the spin, the control column is moved full forward and the wheel is set full against the spin.

The all-wing is spin resistant and will spin only with the rudders with the spin, the wheel with the spin and the control column is neutral or full back.

▶**Development Merited**—The all-wing possesses extremely promising advantages in performance over the conventional plane, but these are accompanied by several stability and control problems which have, as yet, been only partially solved.

Obviously, the greater efficiency of the all-wing configuration makes it a superior aircraft when compared to those of conventional configuration and it is these performance advantages that make the extensive research and development required for the full solution of its stability and control problems well worth while.

John K. Northrop has made profound progress in this direction and can rightfully be regarded as the pioneer designer of all-wing aircraft.

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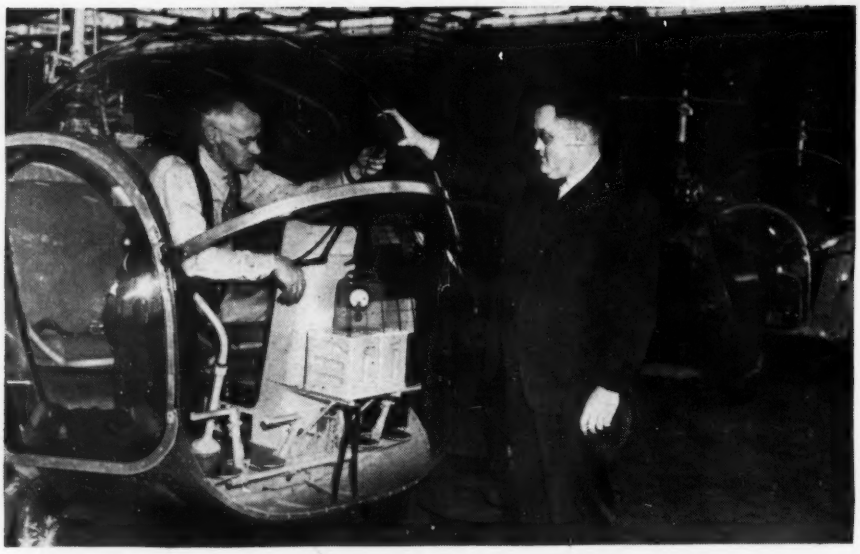


HOW THICK IS A BUBBLE?

Nicely tagged "Bubble-ometer," this electronic device developed by General Electric is used by Bell Aircraft Corp. to measure thickness of Plexiglas canopies on its helicopters. Gage resembles electric razor, and operates on resistance principle. Dial registers distance between small steel block touching outside of bubble and magnetic device held against inside. This gives thickness of canopy at any point selected. Canopy has minimum thickness requirement of 65/1000 and is blown with 75/1000 as target. GE engineers say the measuring device can detect 5 percent variation.

NACA Investigates High-Altitude Gusts

"Clear air turbulence" may become a familiar term in the coming years if present scientific investigations of this disturbing phenomenon produce expected results.

While the prevalence of gusts near cloud formations at altitudes below 30,000 ft. is a well-known and thoroughly analyzed natural occurrence, pilots have often reported gusts in clear air at altitudes above 40,000 ft.—heretofore believed an "over-the-weather" height.

Although in the past these reports were either discounted or assumed to represent isolated occurrences, ability of postwar aircraft to operate at altitudes above the isothermal layer has increased the frequency of the reception of such reports.

▶**Gust Research**—To provide comprehensive scientific information on this new phenomenon, the National Advisory Committee for Aeronautics has launched a research program utilizing a "gustsonde" to provide the required information.

This device is an adaptation of the familiar radiosonde. While the latter transmits coded temperature, density and pressure data, the new apparatus transmits only the accelerations it experiences as it descends slowly from high altitude.

▶**Operational Details**—The gustsonde is a small box housing an NACA accelerometer which feeds signals into a tiny transmitter. These pulses are telemetered to the ground where they are recorded for subsequent analysis.

The apparatus is suspended from a balloon, which, upon release, carries the instrument to altitudes above 100,000 ft.

At this altitude the low atmospheric pressure allows the balloon to expand and burst. The gustsonde is then lowered to the ground by parachute at an average rate of 1000 fpm., thereby requiring about 1½ hr. for descent.

Obviously, a considerable quantity of data on conditions encountered can be recorded in this period.

▶**Initial Trials**—First experiments with the new device took place last summer at Fairfield-Suisan Air Force Base, Calif., under the joint direction of the NACA, Base Weather Station and the 308th Reconnaissance Group (VLR)-Weather.

First tests were made over the Mojave Desert, where clear air turbulence has been reported more often than in any other part of the country.

Value of the new program lies in the possible importance of the research findings to the design of high-speed aircraft and missiles intended for operation at these extreme altitudes.

The presence of severe gusts would require a substantial increase in the strength of the craft to carry the additional structural loads imposed.

Captured Wind Tunnel Reaches Mach 5.18

The unique "Kochel" wind tunnel has been placed in operation at the Naval Ordnance Laboratory, White Oak, Md. and has attained Mach 5.18—highest yet reached in an installation of its size—in preliminary tests.

This velocity was attained at a temperature of —377 F. and is the equivalent of 3937 mph. at sea level under standard conditions.

▶**Tunnel History**—The tunnel is so named because it was located near Kochel, Bavaria at the time of its capture by Allied soldiers. It was originally built at Peenemunde but was moved to a new site at Kochel to escape Allied bombardment.

It was dismantled, shipped to the U. S. and re-assembled by Navy Bureau of Ordnance, under the direction of Cmdr. H. M. Mott-Smith.

The facility actually includes three separate tunnels operated from a central power supply. Two are 40 cm. square (15.75 by 15.75 in.), the other 18 cm. square (7.1 in. by 7.1 in.).

Power is supplied by a huge 52-ft.-dia. steel sphere which is emptied to a near-vacuum by a 300-hp. electric motor driving two rotary vacuum pumps.

▶**Operation**—When the test section of one of the two larger tunnels is ready, a quick-operating stop cock valve is opened and the pressure difference between atmospheric pressure at the tunnel entrance and near-zero downstream of the test section produces the high velocities across the throat.

However, these velocities are obtained only between the time the stop cock is opened and the sphere pressure approaches atmospheric conditions. At maximum Mach number, this time is 20-40 sec., depending on density, pressure and temperature.

The shock wave then moves forward through the throat and into the entrance to stop the supersonic flow. Repumping time is about 15 min. The two tunnels are used to permit more rapid adjustment of models and preparation of tests in the tunnel not in use.

In contrast to this short test period, however, the 18-cm. tunnel can be operated continuously by the intake of the vacuum pumps, although this, of course, renders the other two tunnels inoperative.

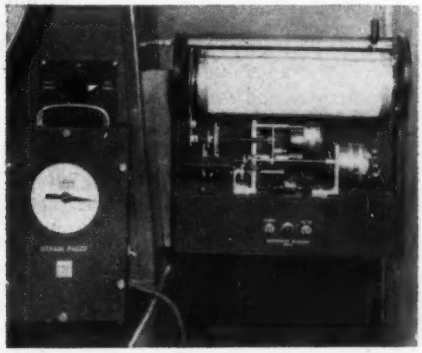
▶**Performance Improved**—Much of the equipment of the tunnel is new, particularly the sphere, motors and pumps, and various other items of equipment.

Actually, performance of the tunnel has been substantially improved in the re-building operation, since in Germany its maximum speed was Mach 4.38, used in preliminary research on the V-2.

NEW AVIATION PRODUCTS

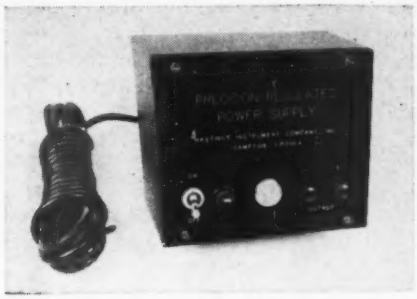
New Synchrotel

New version of Synchrotel, made by **Kollsman Instrument Div. of Square D Co.**, 80 45th Ave., Elmhurst, N. Y., is reported to have electrical output increased 500 percent, with weight and volume decreased to 1/3 of former unit. Unit functions as inductive electrical pickoff wherever driving torque is so small that conventional synchro cannot be used. Lightweight rotor makes it useful where very high accelerations and rapid oscillations are to be measured. Device is stated as readily adaptable to flight and engine instruments and may be incorporated in case of regular dial and pointer instrument or in blind transmitting instrument to be remotely located. Other typical applications are in airspeed and altitude controls for automatic pilots, flight test recorder inputs, air traffic laminar controls, bomb and gun sight computer inputs, telemetering, and in most conventional synchro systems.



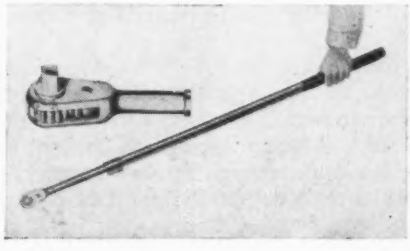
Strain Rate Pacer

Operating in conjunction with company's testing machines, new type strain rate pacer is announced by **Baldwin Locomotive Works**, Phila. 42, Pa. Feature is reported to be more accurate and direct indication of displacement rate between test specimen gage points as compared with pacing rate of motion of testing machine crosshead. Transmitter unit is mounted in company's autographic recorder and controlled by extensometer on specimen. Indicator unit, in small cabinet, is connected to recorder by extension cable with polar plug. Essential elements of indicator are dotted disk, rotated by synchronous motor at predetermined speeds, and coaxial pointer rotated by self-synchronous motor under control of self-synchronous generator unit in recorder, at rate proportional to strain in specimen. Straining rate in specimen can be set and maintained by adjusting machine load rate control valves until pointer speed coincides with predetermined disk speed. Pacing speeds are combined function of strain-follower magnification and speed of rotation of pacing disk.



D. C. Power Supply

Developed for use with instruments requiring highly stable d.c. voltages, precision-regulated power supply made by **Hastings Instrument Co.**, P. O. Box 1275 Hampton, Va., is stated to be adaptable to wire strain gages, position potentiometers, recording oscillographs, and other laboratory devices. Output voltage regulation is reported better than 0.1 percent and ripple less that 0.01 percent. Device is adjusted by manufacturer for optimum regulation at any specified load of from 5 to 30 ma. and for output voltage from 0 to 100. Regulation is thus obtained within ± 0.1 percent for input line voltages varying from 75 to 135 a.c. at frequencies from 50 to 400 cps. Unit measures $4 \times 5 \times 6$ in. and weighs 6 lb.

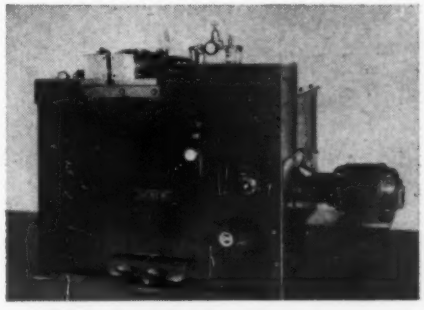


Mechanic Aid

New heavy-duty torque bar, made by **Richmont, Inc.**, 2810 East 11 St., Los Angeles 23, Calif., is stated to possess extreme accuracy in ranges from 200 to 600 lb.-ft. Device is pre-set for specific requirement and when desired torque is reached loud "click" is heard and simultaneously, small button in handle taps operator's hand, thus giving both "sound" and "touch" signals. Bar is available with or without detachable head or with special heads built to specifications. Standard chrome-moly head is a reversible ¾-in. square drive ratchet type. Truss rod is stainless steel. Simple adjustment varies torque setting.

For Aluminum Welding

New welding process, known as "Aircomatic," may be used for welding heavy sections of aluminum and aluminum alloys at wire feed speeds ranging from 100 to 300 in. per min., and is stated to permit deposition rates exceeding those attained by usual welding methods. Announced by **Air Reduction Sales Co.**, 60 E. 42nd St., New York 17, N. Y., method consists of feeding consumable wire through a manually operated welding "gun," with metals being welded shielded from air by inert gas. Filler metal carries welding current and arc is maintained between end of wire and work. Power is supplied from standard d.c. welding generator. Gun is equipped with trigger unit and jog button for feeding wire when not welding. To start welding, trigger is depressed (it can be locked in "on" position by button). This starts flow of shielding gas. Electrode, is scratched on the work, and when arc voltage is established, controls operate to energize feed motor and deliver filler metal.



Close-Tolerance Welder

Hydraulically operated flash welder, Type HAB, completely automatic except for loading and unloading is announced by **Agnew Electric Co.**, Milford, Mich. While hydraulic pump supplies pressure to actuate movable platen and flow valve controls flash cycle, air is used for clamping. Dies are replaceable inserts which minimize cost and make practical broad application of work. Tap switch on transformer provides wide heat range for diversified production. Machine is equipped with water-cooled 50-kva. transformer and clamps, welder type magnetic contactor and all necessary pressure controls. Unit is claimed to be particularly designed to give uniformity of welds and afford close tolerances.

Troubles of French Air Force

Obsolete aircraft, dollar and sterling shortage, trainer lack and low pay are major problems.

By Boyd France

PARIS—The plight of the French Air Force today starkly highlights the defenselessness of Western Europe.

Here's what the French Air Force now has in planes, men, and organization:

Planes are worn out and obsolete. Britain has agreed to loan France 30 Vampire jets and some new trainers. But they have not arrived. French pilots still fly 1944 Spitfires, Mosquitoes, Mustangs, and Thunderbolts.

▶**Strength** – Total strength of the French air fleet is about 3000, of which roughly 1500 are considered first-line. But most would have landed in the scrap yard long since in either the U. S. or Britain.

"Combat" planes account for about 500 of the total number, transports for 200, bombers for one ragged squadron, trainers 900, miscellaneous liaison craft for the rest.

Organizationally this fleet is divided into 15 combat squadrons, eight training squadrons, one bomber squadron plus colonial and transport squadrons.

The First French Air Division based in Germany is the heart of the French combat force. It is equipped with the best fighters in the fleet—mostly 1945 Spitfires and Thunderbolts; includes a reconnaissance squadron. The rest of France's fighters are scattered throughout the colonies with the heaviest concentration in Indiochina, next heaviest in North Africa, a few in Madagascar.

▶**Bombers Missing**—Bombers have been practically cut out of the French Air Force's budget. At the end of the war France was operating three bomber squadrons. Now it has only one Halifax four-engine squadron based at Bordeaux and converted to transport duty. French airmen generally agree that bombers represent a futile expense right now. They reason that France would be lucky to be able to defend itself in a future war; foolish to try to take the offensive.

The Air Force's transport fleet has turned in an impressive record of hard flying over the long dangerous routes of the French Empire. Last year it lugged 130,000 passengers (30 percent of Air France's total) more than 100 million passenger-miles (30 percent of Air France's total); racked up 11,250,000 ton-miles (11 percent of the Air France record).

But it's hard to see how this record can be maintained much longer without some new planes. The transport corps is flying three-year-old Junker-52s, and DC-3s. About half of the Junkers have a year or more of life. But almost all of the DC-3s are flying on borrowed time. And they can't be replaced by Junkers when their time is up.

A grab-bag of light liaison and patrol planes rounds out the French air fleet. In all there are more than 70 different types. Nord-1000 (ex-Messerschmitt 108), twin-engined German Siebels, Cessnas, Beechcrafts, Caudron-Goelands are the most numerous in the light plane category.

▶**Industry Behind**—The most galling aspect of this depressing equipment picture to French airmen is the heavy reliance of the French Air Force on foreign-make planes. The French aircraft industry was badly disrupted during the war. A strong dose of nationalization and nearly two years of Communist management have tended to keep it that way. It probably will be at least another two years before the industry will be turning out modern planes at an adequate rate. The French are currently doing a lot of experimentation with jet designs; expect to test and fly about 25 jet prototypes—mostly fighters—during the coming year. But production still is several years off.

Meanwhile the French must continue to patch up their threadbare air fleet with imported engines, parts, and airframes. Foreign buying will be kept to a minimum though for two reasons:

- France is desperately short of dollars and nearly out of sterling.
- French airmen suspect that they never will be able to buy the newest types of warplanes abroad.

▶**Personnel**—Men of the required caliber are getting as hard to find as planes. Example: last year only one graduate of the famous Ecole Polytechnique—formerly a fertile breeding ground for air cadets—signed up for the Air Force.

Both the caliber of new air force volunteers and training facilities have declined in the past two years. Largest group of applicants for air schools consists of naval academy rejects.

Facilities for training aviation mechanics, radiomen, navigators and so forth still are good. The radio school at Auxerre and the mechanics school at Rochefort offer training comparable to that of the U. S. or Britain.

But flight training in French Air Force schools is badly crippled by the general plane shortage. The Air Force has 900 trainers—mostly British, given to the French at the end of the war. More than 50 percent of these are kept flying day and night. One by one they are wearing out. No replacements are in sight.

The French 15th Squadron theoretically is being trained in jets. But training still is exclusively theoretical since they have no jets in which to train.

Reasons for the falling off in Air Force enlistments are simple.

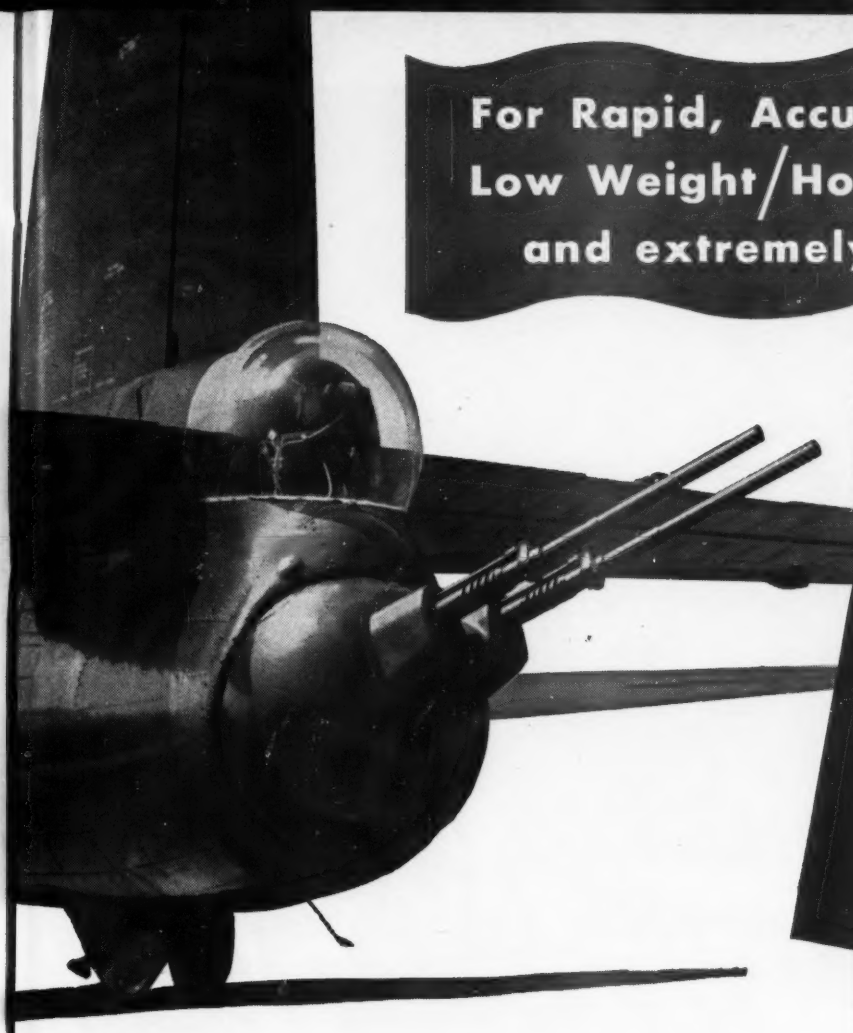
▶**Low Pay**—Air Force salaries are wretchedly low compared to U. S. or British standards. A French second lieutenant receives a minimum of 173,000 francs per year (roughly $575 at the official rate of exchange). His maximum salary is 241,000 francs per year ($825). He may earn 133,560 francs flight pay per year ($445).

Worse than the low total salaries to airmen is the reduction which has occurred in the percentage of flight pay to basic pay. Second lieutenants in 1914 were payed 250 francs a month plus 250 francs flight pay. This ratio was maintained with some ups and downs between wars. Now this 100 percent ratio of flight pay to base pay has dropped to roughly 11 percent. The professional and social prestige of Air Force officers within the armed forces has dropped with it.

▶**Promotion Slow**—Prospective volunteers also are discouraged by the fact that chances for advancement in the Air Force are slim. At the time of the Liberation ranks of the officers corps were thoroughly and ineptly purged of a high percentage of officers who had remained loyal to Petain.

Their posts were filled with young untrained resistance leaders many of whom were as incompetent as they were patriotic. Promotions in the field were made more often on a basis of gallantry rather than leadership.

The result is that France has one of the world's youngest and most undertrained air forces. This cuts down both the rate of retirement and of promotion. An attempt to remedy this by lowering the age of compulsory retirement to fifty only made things worse. A cadet must look forward not only to slow promotion. But even if he reaches the higher rank he knows he will be forced to retire too early to live on his pension and too late to start a new career.



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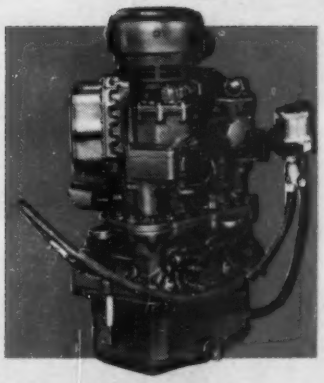
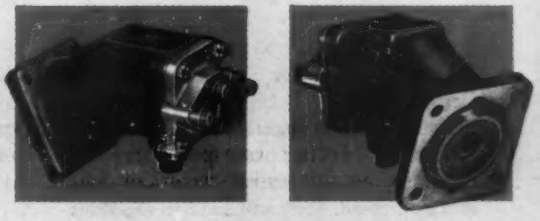


Vickers Double Pump and Control assembly provides complete and independent control of speed and rotation of two hydraulic motors.



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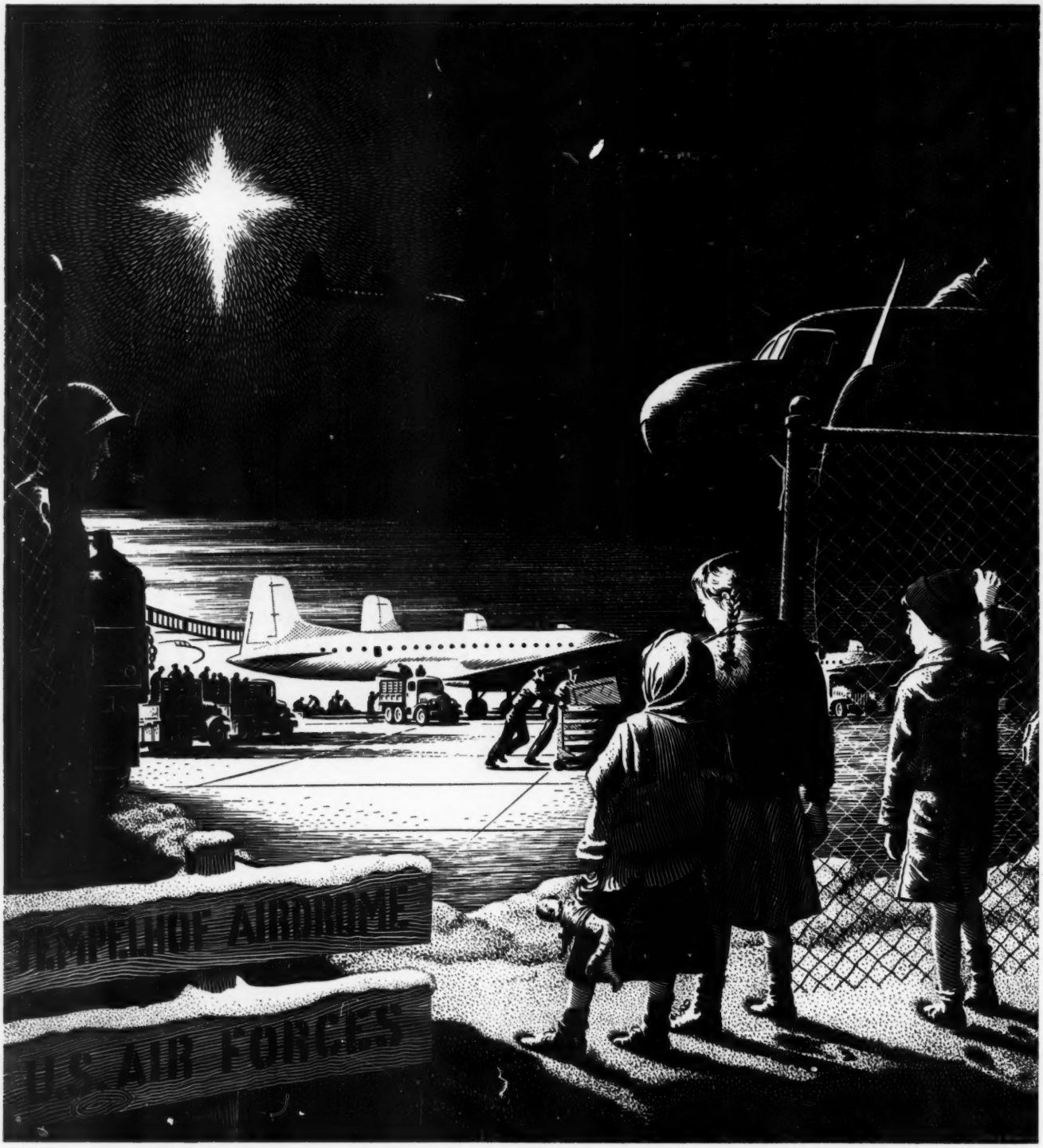

Operation Christmas

This Christmas, the stricken people of Berlin will share a bit of our table, our hearth, and our spirit...thanks to the Airlift. More than ever, our peace-loving Democracy will have meaning to the wretched and oppressed. They will look to the skies where Santa rides high astride roaring engines...and hope will be rekindled in their hearts. Because of the GCA* radar landing system, flights will not fail...a child will not go hungry nor cold. This Christmas, Gilfillan rejoices in its part in GCA.

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Typical of company-owned planes is this Goodrich Beech.

Spokesman for the Business Plane

To aid its 30 member companies, Corporate Aircraft Owners Assn. watches legislation, swaps information.

Business planes are playing an increasingly important role in the operations of many companies whose products range anywhere from oil to hosiery.

Once for the exclusive use of top executives, they are gradually being used in sales and production work.

Greater dependence on these planes has created among the companies that own them a demand for a bigger voice in the legislation that affects their use. Also wanted is improved airport service and more suitable planes.

One organization, set up to tackle these problems, is the Corporation Aircraft Owners Assn., Inc., 444 Madison Ave., New York City.

Founded in 1946, CAOA now has a membership of 30 plane-owning corporations—only three of which are directly connected with the aviation business. This group owns a total of around 100 planes, used for company purposes.

▶**Forum Last August**—First forum was held Aug. 11, in Washington. Although there were less than 30 members at that time, more than 100 plane owning corporations attended.

Founders of CAOA represent some of the nation's largest companies—Republic Steel Corp., Sinclair Refining Co., B. F. Goodrich Co., Bristol-Myers Co., American Rolling Mill Co., Howes Brothers Co., and Champion Paper & Fiber Co.

Mainspring in setting up the organization was W. M. Belden, attorney for Republic Steel Corp., and CAOA chairman. Its aims as explained by Belden:

- To guard against "discriminatory" legislation, regulations and decisions emanating from federal, state or municipal agencies, so that interests of plane-owning corporations will not be adversely affected.
- To promote a medium of exchange of information through a monthly bulletin, surveys, meetings and other activities that will bring members in closer contact.
- To enable corporation aircraft owners to be represented as a united front in all matters where organized action is desirable and necessary.
- To bring about improvements in aircraft, equipment and services through joint, cooperative action among owners, which will result in constructive suggestions to manufacturers, distributors and service agencies.
- To further the cause of safety and economy in the operation of aircraft by the accumulation and distribution of data.

▶**Technical Committee**—An important CAOA service is the technical committee composed of three veteran pilots and headed by Walter C. Pague, pilot for Armco Steel Co. The tech committee works on problems of converting stock models into the types of planes wanted by members.

In this capacity, they will be able to advise airplane manufacturers on plane-owning corporation requirements. The result is that manufacturers will know more fully than they have in the past how to fit the needs of these people.

The committee also evaluates instrument aids and navigational equipment. In addition, it guides prospective buyers in selection of airplanes, though it doesn't recommend any special manufacturers.

Most planes owned by CAOA members are Beechs and Cessnas.

Another service is the pilot pool, from which the members may obtain data on various pilots looking for positions.

CAOA also helps CAA by serving as a point of contact for information from plane-owning corporations.

▶**Permanent Secretary** — Until now CAOA has been more or less loosely organized and no real effort has been made to bring in new members. To improve this situation, it recently appointed a salaried secretary. His major task will be to coordinate activities and initiate a full-scale membership drive.

Secretary is C. B. Colby, former editor of Air Trails and a pilot.

Colby points out that "over 1000 corporations are eligible for membership in CAOA." He emphasizes that "we are aimed primarily at helping the small manufacturers who own airplanes. We don't want to keep this an exclusive outfit."

Colby feels that members' planes would get better service if marked by a CAOA insignia. Airport personnel, knowing they were on business, would be more likely to give them priority over pleasure craft.

▶**5000 Corporation Planes**—He estimates that there are 5000 single and multi-engine corporation owned airplanes—2000 of them multi-engine. "Arabian American Oil Co. alone owns 19, one a C-54."

Colby indicated that aircraft manufacturers should set their sights more on making truly useful business planes. He feels the potentialities of this field have never been fully explored.

Plane-owning corporations "are not looking for wholesale jobs and will pay the price if it's worth it."

Membership in CAOA falls into three classifications: full members—plane-owning corporations not primarily associated with aviation; associate members—corporations in air transport or aviation industry; honorary memberships—extended to persons who have made a noteworthy contribution to aviation.

Only full members have voting power. Membership fee, including that for associate members, is $100 annually.

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Forty-five years ago at Kitty Hawk . . . Orville Wright soared aloft . . . to make mankind's oldest dream of heavier-than-air flight . . . an accomplished fact. ¶ *Despite a complacent belief that this scientific achievement heralded an era of expanding friendship among the peoples of the earth . . . time has shown that in ruthless hands the airplane can be a frightful instrument of aggression.* ¶ *Only three years after World War II . . . and just a year after the Air Force has commemorated its first anniversary of autonomous operation . . . there is abundant evidence that maintenance of a dominant American air power is a vital factor in discouraging aggressor nations. Republic joins with the USAF in committing our entire resources to this end.*

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REPUBLIC AVIATION

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Domestic Freight Traffic

(Ton Miles)

Carrier	First Nine Months 1948	Full Year 1947
Slick	19,945,000	21,937,000
American	14,593,000	14,839,000
United	14,000,000	10,091,000
Flying Tigers	9,008,000	5,654,000
TWA	6,750,000	4,920,000
Cal. Eastern*	4,455,000	11,156,000
Willis	1,186,000	2,329,000
U. S.**	145,000	1,332,000
Totals	70,082,000	72,258,000

* *California Eastern suspended freight operations in May, 1948.*
** *U. S. reactivated freight operations in May, 1948.*

Another Record for U. S. Freight

Survey indicates heavy increase over 1947 ton mile level; scheduled carriers account for most of gain.

By Charles Adams

U. S. airfreight traffic is catapulting toward another postwar record this year, but the independent operators who set the industry pace in 1946 and 1947 are continuing to lose ground to their certificated rivals.

An AVIATION WEEK survey indicates that freight handled by all domestic air carriers in 1948 will be at least 25 percent above the 100,000,000 ton mile level of 1947. The 16 certificated domestic trunklines will account for nearly all the industry-wide gain, with the independents boosting their business very slightly.

▶**Traffic Shifts**—Eight carriers—five certificated and three uncertificated—which flew 72,258,000 freight ton miles all last year (over 70 percent of the industry total) accounted for 70,082,000 ton miles during the first nine months of 1948. But the five independents, which flew more than 58 percent of the eight-carrier 1947 volume, handled less than half of the traffic in the first three quarters of 1948.

The uncertificated carriers—Slick Airways, the Flying Tiger Line, California Eastern Airways, Willis Air Service and U. S. Airlines—are the five independents that have been recommended for certification by Civil Aeronautics Board examiners.

▶**Predictions Too Optimistic**—In estimates furnished the CAB early this year, both certificated and uncertificated groups in the airfreight industry predicted they would increase their traffic more than 100 percent during 1948. But of the eight major carriers studied, only the Flying Tiger Line now seems likely to double its 1947 volume.

Slick Airways, largest domestic freight carrier in 1946 and 1947, almost certainly will take top honors again this year. The San Antonio company flew 11,198,000 ton miles in 1946, 21,937,000 ton miles in 1947 and 19,945,000 ton miles in the first nine months of 1948.

▶**Challenge to Slick**—American Airlines is cutting sharply into Slick's lead, and in September and October of this year became the first carrier to fly more freight than the independent over a sustained period. American accounted for 2,231,000 freight ton miles in September and hung up a new company record of 2,474,000 ton miles in October. Slick flew 2,128,000 ton miles in September and 2,111,000 in October, well below its all-time peak of 3,000,000 ton miles set last May.

Ralph S. Damon, AA president, said last month that his company's freight volume will continue to grow despite intense competition.

"We were forced to hold our freight expansion plans somewhat in abeyance until DC-6 deliveries permitted us to release DC-4s from passenger service and fit them for cargo," Damon stated. "But now we have the airplanes to back up our contention we can give the best freight service in the world." American, which currently operates 14 DC-4 Airfreighters, in addition to combination passenger-cargo ships, last month marked its fourth anniversary of all-cargo service.

Damon said that in spite of American's lower freight volume during the past two years it has consistently received a higher rate of revenue return than its uncertificated competitors. "In 1947," he continued, "American realized $4 million in freight revenues compared with $2.7 million for the largest uncertificated carrier even though their volume substantially exceeded ours.

"This is not to say that our superior freight revenues indicate a comparable margin of profit over our competition. Our favorable rate of return is due to the fact that we provide freight service on a common carrier basis to all the cities we serve, rather than just to the industrial centers. This involves the handling of many small shipments on which rates—and expenses—are relatively higher, especially for short distances."

▶**Profit for Slick**—Early this month, Slick reported that it expects to show an overall profit for 1948 and plans to expand its operations quickly if it receives a certificate from CAB. Lewis J. Moorman, Jr., Slick's executive vice president, said that the company's airfreight operations, together with modification work on C-46s for the Air Force, produced a company profit of $11,000 in the third quarter of this year.

He added that if the CAB certificate is forthcoming, Slick would need possibly $3-5 million additional capital. This money, Moorman declared, could be obtained provided CAB continues its efforts to eliminate unfair competition and rate practices in the freight industry.

▶**Modification Work**—Slick's supply and service division, which is handling C-46 modifications for the Air Force and other customers, helps provide the company with needed income, according to Moorman. "This need arose because of unfair competitive conditions forced on the industry by the subsidized passenger airlines which consistently attempted to establish rates below Slick's costs, which are the lowest in the field. We have reluctantly lowered our rates below costs in some instances to meet those of other airlines, although we know they are uneconomical and are losing money for us and others."

During the third quarter of 1948, Slick reported $931,206 operating revenue from transportation (equal to 14.65 cents a ton mile), plus $38,926 from pickup and delivery, $6541 from other sources and $156,180 from the supply and service division. Without the supply and service division's income, Slick would have shown a sizeable deficit

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throughout the first nine months of 1948.

On the basis of freight revenues alone, Slick has shown profits in only two months (September and October, 1947) since starting operations in March, 1946. The carrier's overall deficit from the time the company was formed until Sept. 30, 1948, was $1,391,990.

▶**Twenty-Two C-46s on Hand**—Slick's fleet consists of six C-46Es (original cost $49,540 each), five C-46Fs (original cost $24,000 to $26,000 each) and a C-46A which is not being utilized. In addition, the company is leasing 10 C-46Fs from the Air Force at $300 a month. On Sept. 15, Slick had 532 employes in its freight operations, including 96 flight personnel, plus 150 employes in the supply and service division.

Like Slick, the Flying Tigers, California Eastern and Willis are supplementing their freight income with other activities.

California Eastern filed bankruptcy action last May 12 but has been leasing its C-54s to nonscheduled operators since then.

U. S. Airlines, which resumed freight service last May after suspending operations for six months, lost $73,147 in the third quarter, bringing its 1948 deficit to $228,489.

Traffic Upsurge Seen for 1949

UAL President W. A. Patterson says prospects are good, but improvement in earning picture depends on CAB.

United Air Lines President W. A. Patterson believes the air transport industry has good prospects for a traffic upturn during 1949, but cautions that any improvement in the dismal earnings picture of 1947-1948 depends entirely on the Civil Aeronautics Board.

In a year-end review, Patterson said that even though surface travel may continue to decrease, his company expects at least to equal in 1949 the volume of almost 2,000,000 passengers carried in 1948. Air mail, he declared, should show some increase as a result of a full year's operation of air parcel post service started last September.

▶**1948 Traffic Estimated**—During 1948, United flew about 1,209,720,000 revenue passenger miles, down about 2 percent from the 1947 figure. Mail volume this year totaled approximately 19,271,000 ton miles, up 7 percent over 1947; express ton mileage was about 7,233,000, up 5 percent; while freight traffic soared to 20,068,000 ton miles, a gain of almost 100 percent.

Regardless of the comparatively bright traffic outlook, United believes profits hinge on what is done by CAB to correct the nation's air transportation pattern and to solve other problems facing the industry.

Patterson noted that costs continue to run ahead of rate increases in the air transport industry. "Since 1941, United's wage expense has risen 67 percent and materials 80 percent," he declared. "Meanwhile, the company's basic fares have been upped only 3½ percent, while mail pay and express rates both dropped 43 percent. Today, only 7 percent of United's revenue comes from air mail as against 95 percent in 1928."

In 1948, United flew an estimated 59,342,000 revenue plane miles—about 96 percent of its scheduled mileage for the year—and almost 70 percent of all flights were completed on time or within 15 minutes of scheduled time. In 1947, the company completed 62,775,400 revenue plane miles, or 94 percent of its scheduled mileage, but only 30 percent were completed within 15 minutes of scheduled time.

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WAL Would Do Away With Meals

Carrier will ask CAB permission to return the saving to its passengers by lowering its fares 5 percent.

Western Air Lines, which has been serving food aboard its planes for 20 years, intends to eliminate free meals on all its flights and routes soon after Jan. 1 and has asked permission to pass the savings along to its passengers.

In announcing the move, Terrell C. Drinkwater, WAL president, described free airline meals as unnecessary frill and expense. He said Western would file new tariff schedules with CAB providing for a systemwide 5 percent fare reduction in all passenger fares—the cut being made possible by elimination of direct and indirect costs connected with meal service.

▶ **Rate War Not Intended**—Drinkwater declared that his company was not engaging in a rate war in seeking the fare reduction. "We are not lowering fares in the sense that the net return to Western from a ticket sale will be reduced. We are merely passing a saving along to the public. Actually, the net yield to Western of a ticket sale will be the same or a little more."

Despite this statement, Western's proposed fare reduction apparently faced strong opposition. United Air Lines, a WAL competitor on West Coast routes, is a strong proponent of meals in flight and has contended their cost is negligible compared with other expenses included in the price of a ticket.

▶ **CAB Position**—Last August, in backing a 10 percent fare hike at a meeting of industry executives in Washington, CAB presented a study showing that the 16 domestic trunklines might have cut their $20,900,000 operating loss last year by $11 million had meal service been eliminated. CAB Chairman Joseph J. O'Connell, Jr., said the Board would have endorsed an additional fee for meals if it had been asked to do so at the Washington meeting. He added that CAB would make further studies and advise the industry later of its conclusions.

Drinkwater said that during the first 10 months of 1948 meal service had cost Western $339,733, equal to 5.24 percent of gross passenger revenues. These figures were used as the basis for the proposed 5 percent fare reductions.

▶ **Short Trips Cited**—Western found that the average person on its system pays $23 for a ticket and rides an average distance of 380 miles. This would be less than two-hour trip by WAL's new Convair-Liners. About 46 percent of Western's passengers are offered meals at present; and about 25 percent of these are not hungry and refuse them.

"One of the big difficulties is that 54 percent of our passengers who don't have meals served them enroute pay the same price for their ticket as the 46 percent served meals," Drinkwater pointed out. "The same is true of those who ride on meal flights but don't eat. Thus about two-thirds of our passengers buy meals for the one-third who eat them.

▶ **Hidden Cost of Meals**—"There is a great deal of hidden cost involved in furnishing meals. We must think in terms of amortizing the cost of food equipment both in the air and on the ground. Such equipment is extremely expensive to buy and maintain, and the cost of extra personnel necessary to provide meal service is proportionately high.

"When Western introduced meals aloft in 1928, one of the desired results was lots of publicity. But now we have reached the point in air transportation where we must decide whether the main tent or the sideshows are going to support the circus."

▶ **Different Views Expressed**—A differ-

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STAINLESS	Sheets and strip—type 302 to AN-QQ-S 772—types 321 & 304 to AN-S 757
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ent view of airline meals is held by other industry executives, including UAL President W. A. Patterson, who believes that meals have become part of the carriers' standard service and a feature expected by the passengers. Patterson said last summer he couldn't understand how anybody can be so naive as to believe meals are not included in the price of the passenger's ticket." Eastern Air Lines President E. V. Rickenbacker and a majority of CAB members think an extra charge should be made for meals in flight.

Drinkwater apparently believes a 5 percent fare reduction will get more passengers aboard his planes than free meals. Western has had a bad traffic slump, average load factors dropping from 64.5 percent in the first nine months of 1947 to 56.9 percent in the same period this year, and 1948 losses have been heavy.

Nonskeds Will Carry Bulk of Immigrants

Commercial airlines—especially nonscheduled operators—are doing a record amount of business with the government's Immigration and Naturalization Service.

Current estimates are that the Justice Department agency will spend over $270,000 for air transportation of aliens this fiscal year—a 10 percent increase over fiscal 1948. The Immigration Service began using the airlines to carry deportees to border points or ports of surface embarkation in 1946.

▶ **Expenses Cut**—In some cases, the aliens have been taken directly to their homelands by plane. The Immigration Service has found that air transportation cuts down deportee detention expenses materially.

While the certificated carriers have been utilized by the Immigration Service, bulk of the work is handled by nonscheduled and contract operators because of the lower rates offered. Most flights carry Latin American aliens from large cities such as San Francisco, Seattle, Detroit, Chicago and New York to Miami, El Paso and San Antonio, with pickups at intermediate points. There is a small trans-continental movement, both east and west.

Nine uncertificated companies will handle most of the deportee traffic between now and June 30—the end of the fiscal year—on the basis of bids opened by the Immigration Service last month (AVIATION WEEK, Nov. 1). The carriers are Airborne Transport, Inc., Jamaica, New York; Airline Transport Carriers, Inc., Burbank, Calif.; Aviation Corp. of Seattle, Seattle; Lincoln Air Lines, Dallas, Tex.; Miami Airlines, Miami, Fla.; Seattle Air Charter, Seattle; Standard Airlines, Long Beach, Calif.; Viking Airliners, Burbank, and Yakima Sky Chief, Yakima, Wash.

Engine Changes Give Tudor IV New Weight

British South American Airways' four-engine Tudor IV aircraft have been certificated at a new maximum weight of 82,000 lb.—an increase of 2000 lb. over the previous maximum weight.

This has been made possible by Rolls-Royce Merlin engine modifications which provide more power for both take-off and climb. As a result, maximum payload for east-west Atlantic crossings under average conditions has been raised to 9500 lb. The Tudor IV will now be able to carry its full load of 32 passengers on all sectors of BSAA's routes, in addition to carrying an increased volume of freight.

BSAA is using Tudor IV's to replace its Lancastrians on routes from Havana, Cuba, down the west coast of South America to Santiago, Chile, and Buenos Aires. In the past Tudors have been used only on the trans-Atlantic run from London to Bermuda and Kingston, Jamaica, Tudor IVs will replace Yorks on BSAA's east coast South American route to Brazil and Argentina in February.

AA Family Plan Sparks October Gain

First of the week family fare discounts are giving airline traffic charts a pleasing "new look" and may be a significant factor in brightening up the industry's earnings statements covering this fall and winter.

American Airlines, which last Sept. 13 introduced the new transportation bargain on Mondays, Tuesdays and Wednesdays, has completed a study showing results during October—the first full month of the plan's operation. The survey disclosed that normal traffic peaks, marking weekend ticket sales, and first-of-the-week traffic dips had been leveled out almost entirely.

▶ **Traffic Trend Reversed**—In fact, AA's passenger business on Mondays, Tuesdays and Wednesdays throughout October was slightly better than on Fridays, Saturdays and Sundays.

During October, under the family plan, American handled 6896 customers at full fare and 7637 at half fare. The family fare tariff permits a full-paying adult to be accompanied at half fare by members of his or her immediate family on air trips made during the usually-slack first three days of each week.

AA flew 14,448,963 revenue passenger miles under the family rate tariff in October, of which 7,447,545 were at half fare and 7,001,418 at full fare. The 14,448,963 passenger mile total represented over 10 percent of American's domestic passenger business in the month.

▶ **Dollar Sales Impressive**—October revenue from the family plan was $632,787 and averaged 4.38 cents per passenger mile flown. Half fare tickets (2.95 cents a mile) brought in $219,703 and full fare tickets $413,084 (5.9 cents a mile). Actually, American's net sales under the family tariff totaled $794,124 in October, but this figure includes the value of tickets which would be used (or refunds made) in subsequent months.

In August, before institution of the family fare, American's load factor dropped below 50 percent on three Tuesdays and one Monday over a four-week period. In October, over a comparable period, the carrier's load factor never went under 62.3 percent during the first three days of any week.

▶ **Thursdays Now Low Point**—Highest daily load factor reported by AA in the October period was on a Wednesday. In August, peak loads invariably occurred over weekends, and the poorest day traffic-wise was always Tuesday. During October, the low traffic point was on Thursday in each of the four weeks studied.

American showed an overall domestic load factor of 66.85 percent in October,

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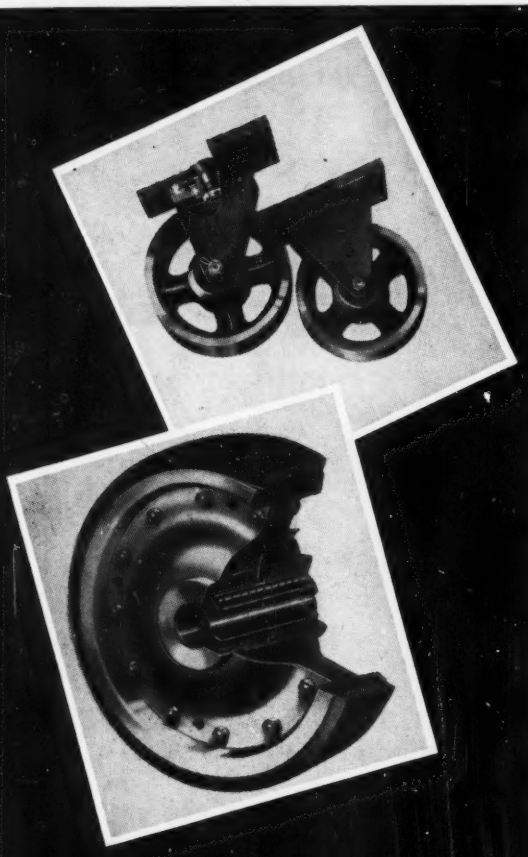

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compared with 56.3 in August. By contrast, United Air Lines, which did not institute a family fare plan until November, reported its domestic load factor declined from 67.8 percent in August to 64.86 percent in October.

▶ **Large October Profit**—How much of American's substantial October profit (reportedly well above the same month of 1947) can be attributed to traffic generated by the family fare is still the subject of intensive company and CAB study. But AA executives state without qualification that they are well satisfied with the plan's revenue-producing results.

Average family group taking advantage of American's first-of-the-week special fares is about 2.3 persons. Forty percent of the half-fare passengers are "first riders" as are three out of every ten full-fare customers using the family plan.

▶ **Tariffs Extended**—Under its original tariff, American's family fares would have expired Dec. 31. The carrier recently asked CAB to extend the plan until Mar. 31. Other "family fare" carriers are asking the same extension.

Airline Group Sues N. Y. Port Authority

The sharp, unrelenting feud between the airlines and the Port of New York Authority came to a head last week in an equity suit filed in New York Supreme Court.

Eight airlines charged that the Port Authority had "intentionally, illegally and without justification repudiated, breached and violated" the airlines' leases at Idlewild.

They denounced the Authority for willful, arbitrary control of Idlewild and asked the court to determine whether as a business organization it is "legally and morally bound to honor contracts recognized as valid and binding."

Suit is for judgment directing the Authority to honor leases which the airlines contracted with the City of New York in 1945. The airlines say the Authority, before taking over Idlewild, agreed to recognize the leases.

▶ **Immune from Suit**—In naming the Port Authority, "a body corporate and politic," as a defendant, the airlines directly attacked that organization's claims to immunity from suit. They also named as defendants two executives and the Authority's twelve governing commissioners. The executives are Austin J. Tobin, executive director, and James C. Buckley, director of airport development.

Outcome of the suit, primarily one to get the airlines into Idlewild under terms of their earlier contracts, will have far-reaching effects. Success of the airlines' action would be a double

blow to the Port Authority, partly because it would be precluded from using its own rate system but mainly because its claim of immunity from suit would no longer stand.

► **Colonial Not Included**—If the Authority can be sued over Idelwild, its other vast operations will be vulnerable to similar actions. The Authority declined official comment immediately after the suit was filed, although a spokesman expressed belief it could not legally be sued.

Colonial Airlines, after participating with the other carriers in previous moves against the Authority, is not one of the plaintiffs in the current action. Colonial doesn't want to make the move from LaGuardia Field because of certain traffic difficulties and higher costs. But it supports the others in their basic differences with the port agency.

SHORTLINES

► **Alaska Airlines**—CAB has approved the carrier's application for a $232,000 loan from the Reconstruction Finance Corp.

► **American**—Is promoting winter travel with an informative folder pointing to its safety and dependability record between November and February during the past three years. The leaflet is aimed at people "who would as soon walk as travel by air during winter" and states that "actually, seasons have nothing to do with safety."

► **BOAC**—Sir Miles Thomas, deputy chairman, stated he was well satisfied with the corporation's western division operations in North America following a recent inspection tour.

► **Delta**—Is training 16 men with copilot qualifications to take over flight engineer duties on its five new DC-6s.

► **National**—Has raised its fares to the same level as those of competing carriers (Eastern and Delta). Prior to settlement of the pilot strike, NAL president, G. T. Baker said he would not lift basic fares 10 percent despite CAB's recommendations last August. The new higher fares provide for a 5 percent discount on roundtrips . . . A CAB examiner has recommended approval of a Capital Airlines-NAL equipment interchange for service between Capital's points east of Pittsburgh and north of Washington and points on National's Route 31 south of Washington. He said the interchange operation to capital cities west of Pittsburgh would not be in the public interest.

► **Northwest**—L. L. Sheets has been named assistant director of sales.

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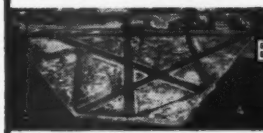

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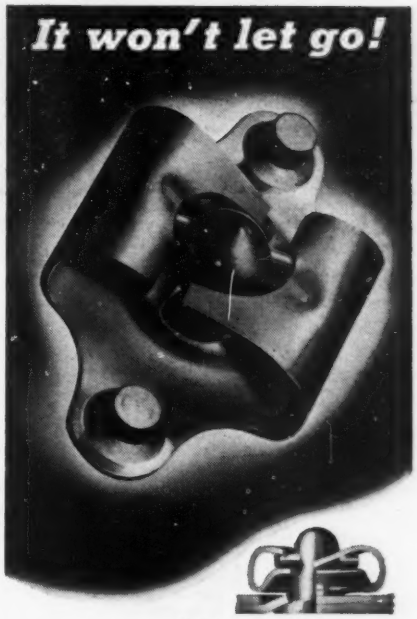

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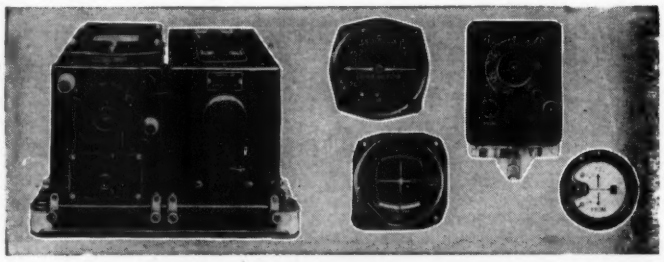

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▶ **Pan American**—Has taken delivery on its 20th and last Convair-Liner . . . Carrier is offering all-expense trips to European ski centers . . . Semi-weekly Boston-Bermuda Constellation flights are to be inaugurated Dec. 30.

▶ **Robinson**—Has announced an agreement whereby American Airlines handles ticketing, loading, dispatching and communications for the feeder at Buffalo, Rochester, Niagara Falls, Elmira-Corning and Albany, N. Y.

▶ **Scandinavian Airlines System**—Plans to fly a DC-4 load of emigrants from Copenhagen to Australia this month.

▶ **United**—Is continuing its practice of lending traffic, reservations and passenger service personnel to Eastern Air Lines during winter months. Forty-five UAL employes have been assigned to EAL, and 40 more will follow. In the spring, Eastern lends personnel to United.

▶ **Willis Air Service**—Reports its newest maintenance customer at Teterboro (N. J.) Air Terminal is Economy Airways, irregular carrier using C-46s.

▶ **Wisconsin Central**—M. J. Barnes has become sales manager. . . . The feeder has begun installation of two-way very high frequency radio equipment over its entire system.

CAB SCHEDULE

Dec. 29—Oral argument in Capital-National equipment interchange case. (Docket 3291.)

Jan. 4—Hearing in TWA route consolidation case. (Docket 2581 et al.)

Jan. 10—Oral argument in Continental Air Lines route consolidation case. (Docket 576 et al.)

Jan. 10—Hearing on TWA's complaint against Seaboard & Western Airlines. (Docket 3346.)

Jan. 10—Hearing on TWA's complaint against Pan American Airways' Saudi Arabian service. (Docket 3264.)

Jan. 17—Hearing in Capital Airlines' New York-Chicago nonstop case. (Docket 1789 et al.)

Jan. 17—Hearing in New England states service case. (Docket 2196 et al.)

Jan. 23—Hearing on Board's enforcement proceeding against Transocean Air Lines. (Docket 3244.)

Jan. 24—Hearing on Board's investigation of National Airlines route transfer. (Docket 3500.)

Jan. 25—Hearing on Western Air Lines-Arizona Airways San Diego-Yuma route transfer. (Docket 3440.)

Jan. 31—Hearing on additional service to Puerto Rico. (Docket 2123 et al.)

Jan. 31—Hearing on Board's enforcement action against Nats Air Transportation Service. (Docket 3456.)

Feb. 2—Hearing on Florida trunkline service. (Docket 2215 et al.)

Feb. 16—Hearing in reopened Mississippi Valley and southeastern states cases. (Dockets 548 and 501 et al.)

Mar. 7—Hearing in southern transcontinental route case. (Docket 1102 et al.)

LETTERS

Propeller Power Plants

Your AVIATION WEEK page Oct. 25, "Propulsion Grab Bag," presents an interesting analysis of a very important and controversial subject. However, since the point of view expressed is strongly biased in favor of the turbojet engine we believe there are a number of points regarding propeller power plants which will be helpful to AVIATION WEEK readers . . .

1. Your article states that "after the turboprop engine passes 400 mph. its performance goes haywire and its fuel consumption sky-rockets." On the contrary the turboprop powerplant gives its best performance from the standpoint of both output and specific fuel consumption at speeds of 400 to 550 mph. For example, the specific fuel consumption in terms of horsepower per hour is about 30 percent less at 500 mph. than at takeoff. In terms of thrust a typical value for the propeller turbine engine is about 0.7 lb. of fuel per lb. of thrust per hour at 500 mph. at 35,000 ft. which compares to 1.1 to 1.4 for turbojet engines.

2. The article further states that "high altitude characteristics of the turboprop engine are markedly inferior to its sea level output." Some reduction in maximum power available at altitude is characteristic of the turbine type of engine, whether propeller or jet, but the very important characteristic of specific fuel consumption improves with altitude.

3. Your article states, or at least strongly implies, that the place of compound engines is at speeds of 200 mph. Inasmuch as present non-compound piston engine airplanes are flying in the 300-350 mph. cruising range and since the compound engine is an improvement over the non-compound type, it is apparent that the compound engine-propeller power plant is an extremely useful one for cruising speeds up to something of the order of 400 mph. For the turboprop powerplant your article places the limit of usefulness of the turboprop engine at 300 mph. This is entirely contrary to fact as the turboprop powerplant becomes particularly useful in the 400-475 mph., and probably higher, category.

4. There is no informed basis for the statement that "propellers large enough to absorb turboprop powers actually weigh as much as the engine itself," since propellers weighing between 0.2 and 0.25 lb. per takeoff brake horsepower or from one-third to one-half of the engine weight are available.

5. Fuel consumption of the turboprop powered airplane at 500 mph. will be at least one-third less than the turbojet airplane. The current fuel bill of our domestic airlines is about $70 million per year with reciprocating engine-propeller power. With higher cruising speeds regardless of the type of power plant the fuel requirements will be still higher but comparing propeller airplanes with turbojet airplanes it is obvious that the annual cost with the latter type will increase by an amount of the order of $35 million.

6. Another point in your article is that the field of turbojet application is indicated as 550 mph. and above. Since the article had previously limited the propeller airplanes to 300 mph. or less, this leaves the field between 300 and 550 mph. or a ratio of nearly two to one which presumably will not be exploited by any type of power plant.

7. Propeller airplanes have the advantages of (a) reverse thrust for landing, particularly on slippery runways, (b) superior takeoff including hot weather operation and (c) flexibility of operation with regard to cruising speed and altitude. Use of 450-550 mph. cruising speeds can be available with turboprop airplanes without awaiting for the development of new types of airway traffic control systems which even the most enthusiastic jet transport advocates concede will be necessary before all weather jet transport planes can be operated.

8. Turbojet bombardment airplanes have good high speed but only moderate range. For maximum range, however, a propeller airplane is mandatory. The turboprop power plant is the best type with which to obtain both speed and range and therefore development of airplanes having this type of propulsion must be carried on so that we will have an efficient long range air force.

GEORGE W. BRADY, Chief Engineer
Propeller division
Curtiss-Wright Corp.
Caldwell, N. J.

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SALES ENGINEER available January 1, 1949, 18 years aeronautical experience. 12 years engineering-6 years sales. Desires connection with responsible company covering west coast. PW-7339, Aviation Week.

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MAJOR JUST out of U. S. Air Forces, pilot with several thousand hours, over a thousand being four-engine time, has a commercial pilot certificate, all ratings, desires a flying job with a cargo line, a corporation or as personal pilot. Will go any place. PW 7366, Aviation Week.

(Continued on page 46)

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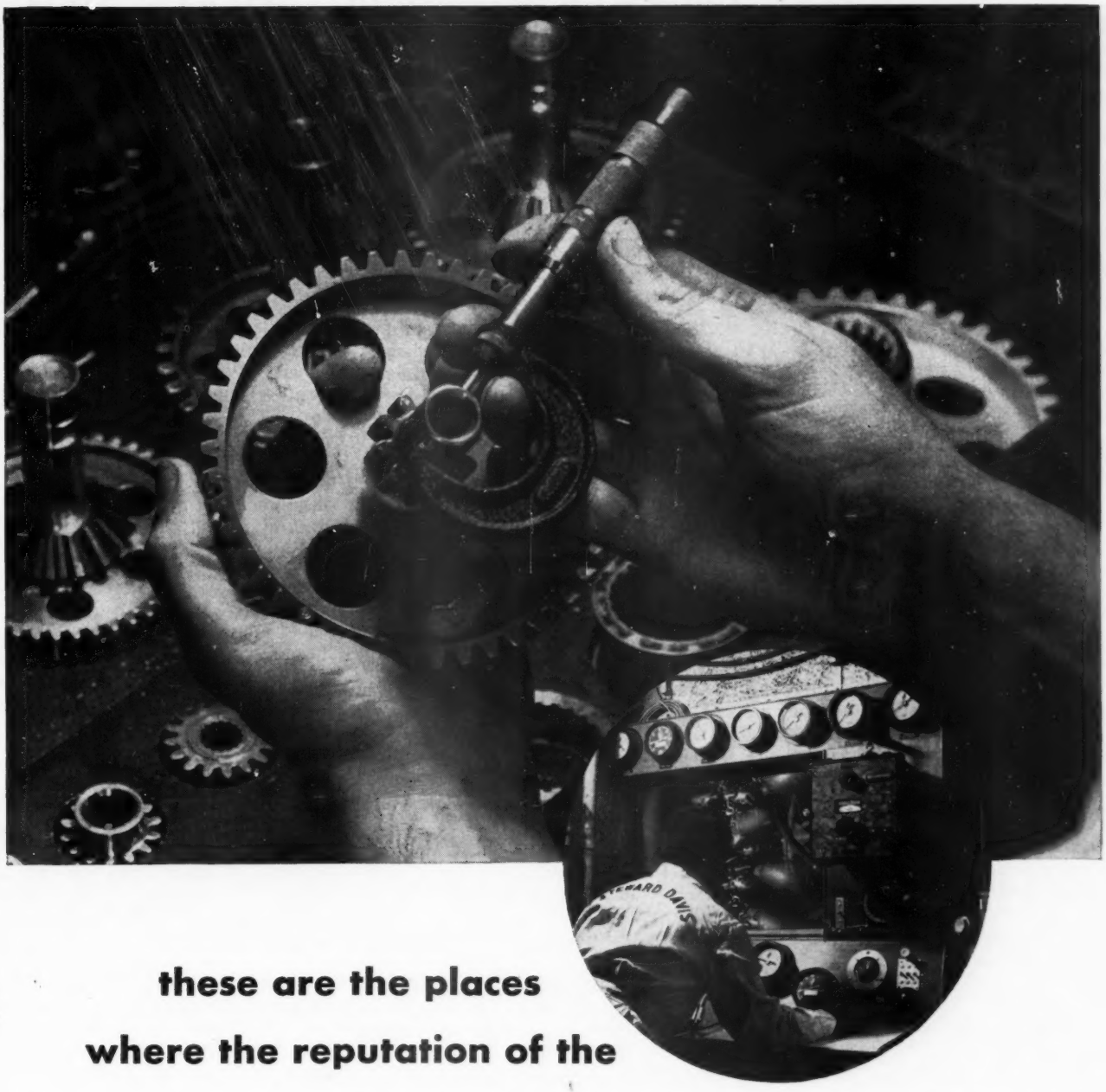

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STRICTLY PERSONAL

RUGGED AIRLINE OF THE EAST—Lockheed's **Bert Holloway** sends us the funniest account of an airline trip we ever saw. He thinks it's worth running here even if **Henry McLemore** did write it first for the McNaughton syndicate. We agree. Here goes Henry:

Our troubles only started with the entry permit. Cradled in the foothills of the Himalayas, Srinagar is 480 miles from New Delhi, and is served by one of the youngest airlines in the world, using what must be some of the world's oldest planes.

I am sure that Orville or Wilbur Wright would have thought twice before boarding the one we traveled in, especially had they known that at one stage of the journey the plane must pass through 10,000-ft. Banihal Pass, guarded on both sides by snow-clad peaks and, at this time of year, blanketed most of the time by a combination of rain, fog, mist and clouds.

Having traveled the last two months in luxurious Pan American Constellations manned by crews with years of experience behind them, it was with more fright than pleasure that we headed for Srinagar. The sight of the crew was not reassuring, either. The copilot wore a turban but no shoes. The pilot sported a beard, a tight-fitting white coat that reached below his knees and sandals.

The weather was nasty when we walked out to the plane, but the young man who collected the tickets made us feel much better when he said to us, "All of us here will be praying that you get there safely."

The third comforting experience came when, after all passengers were loaded, and the door had been locked, it was discovered there was no radioman aboard. The door was opened and the steward hustled off to find one. He returned with a gentleman wearing a purple turban who told the pilot he was a radioman. The pilot asked for his papers. The gentleman said his papers were in his room in New Delhi and that it would take him an hour to get them. They argued for a full 20 minutes with the alleged radio expert repeatedly saying, "Don't I look like a radioman?"

Finally, the pilot took his word, the "radioman" jumped in, scurried forward, put on his headset, and we were off.

After we had been in the air 15 minutes the NO SMOKING sign still showed and I asked the steward why passengers weren't allowed a cigarette. His answer was as relaxing as a kick in the face.

"Why, one little spark in here and the plane will burn up like powder. Pouf! Pouf!"

After nearly two hours of flying we landed at Amritsar for gas. We stayed three hours waiting for a weather report on the pass. I asked the pilot if the pass really was as dangerous as everyone said it was. He made my heart leap with joy by saying it was even worse than it was said to be.

"You'll see," he said with a smile. "Very narrow. Bad winds. One miscalculation and we will have had it."

As we circled the Srinagar airport I noticed the fine paved strip, but we landed in a grass field. I asked the steward why we didn't use the strip.

"That's for the military. They won't let us use it. Says we don't fly well enough and will ruin it."

Strange to say, the line never has had an accident.

WIND BAG PILOTS—Our quizzical squib recently about American balloon pilots continues to bring in the mail. A reader signing himself M.T.V., at the Wichita Club, Wichita, Kan., points out that National Aeronautic Assn. should be able, as the U. S. representative of the Federation Aeronautique Internationale, to make available a list of U. S. holders of FAI balloonist pilot certificates. M.T.V. says there are, indeed, "several hundred expert balloonists in captivity" in this country.

Tom Knowles, Goodyear Aircraft Corp., objects to our calling the vehicles "wind bags." They are sometimes known as "the blown-up competition," Tom says. "This note," he adds, "isn't meant to be helpful, but merely to show you the column gets read. . . ."

BITS ABOUT PEOPLE—Genial, smart **Sam Solomon** was in New York last week grinning over quick success of Pan Am's and Capital's air coach experiments. Sam spent well over $100,000 trying to establish Atlantic Airlines, an all-coach, low-cost carrier, but CAB said it was impractical and wouldn't work. . . . **Robert Lees**, aviation old-timer, formerly with the Maritime Commission and later one of the executive staff of TWA, will be welcomed back to the U. S. any day now after a stint on Gen. Clay's economic advisory corps in Germany. . . . **Helen Hess**, formerly in charge of women's activities for the ATA, is now public relations director of the Palace Hotel in San Francisco. R.H.W.

WHAT'S NEW

New Books

"ASTM Standards on Petroleum Products and Lubricants," prepared by ASTM Committee D-2, details methods of testing, specifications, definitions, charts and tables. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $8.

"Rocket Development," liquid-fuel rocket research from 1929-1941, by Robert H. Goddard. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price $6.50.

"Young People's Book of Jet Propulsion," by Frank Ross, Jr., illustrated explanation of principles and description of jet aircraft. Published by Robert M. McBride & Co., 200 E. 37 St., New York 16, N. Y. Price $2.75.

"Fifth Air Force," an interesting 75-page photographic history of the "Fifth" in peace and war. Available from the Directorate of Public Relations, Department of the Air Force, Washington, D. C.

Trade Literature

"Catalog of Academy of Aeronautics," a 32-page informational booklet on the Academy of Aeronautics, Inc., affiliated with Casey Jones School of Aeronautics, LaGuardia Field, N. Y. Available upon request.

"The Starrett Story," a 32-page booklet giving a brief account of the origin and development of the L. S. Starrett Co., Athol, Mass. Available upon request.

"The Norma-Hoffman Cartridge Ball Bearing," a 24-page booklet, illustrated. Available upon request to Norma-Hoffman Bearings Corp., Stamford, Conn.

"Cincinnati Power Brakes," a 72-page illustrated booklet covering company's complete line of power brakes. Available upon request to The Cincinnati Shaper Co., Cincinnati, Ohio.

"The Improvement of Metals by Forging," a 44-page catalog available upon request to the Steel Improvement and Forge Co., 970 E. 64 St., Cleveland, Ohio.

"Regulation as a Tool in the Development of the Air Freight Industry," a 40-page reprint from the Virginia Law Review, Volume XXXIV, No. 7, October, 1948.

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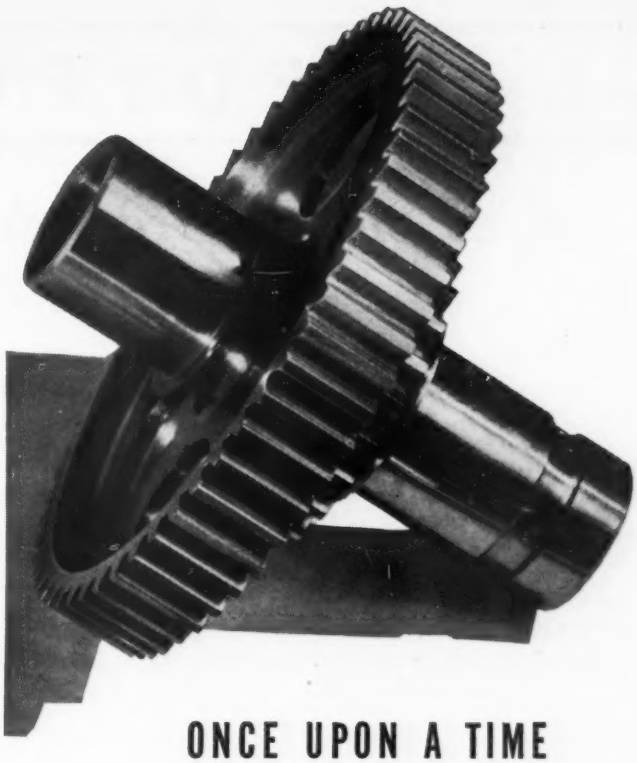

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EDITORIAL

CAB Should Order A Skycoach Investigation

(Today's editorial has been written by AVIATION WEEK's *Transport Editor)*

The Civil Aeronautics Board's suggested withdrawal of the blanket exemption under which large irregular carriers operate poses a distinct threat to future development of low-cost air transportation.

As it now stands, CAB's contemplated action can rid the industry of some bad conditions at the cost of putting nonskeds out of business on a wholesale basis. But without the competitive spur of the independents, what would happen to the certificated airlines' budding interest in skycoach operations?

If CAB carries through its proposal to straitjacket the nonskeds it should at least open a full-scale investigation into the merits of second-class air transportation as it did with regard to short-haul feeder services. Expedited action on the irregular operators' applications for certification would also appear to be in the public interest. CAB cannot afford to adopt an ostrich-like attitude toward the traffic-generating potentialities of the air coach.

Undoubtedly irregular passenger lines on the transcontinental, New York-Puerto Rico and Pacific Northwest-Alaska runs have operated in knowing and continued violation of the nonscheduled exemption as CAB interprets it. Cutthroat rate practices by some uncertificated operators and ticket agents that have "fronted" for them have developed to an intolerable degree. Public enthusiasm for skycoaches has been dampened by ticket agents who advertise rock-bottom prices as a come-on and who vanish overnight with their receipts, leaving the customers stranded.

Passengers who buy skycoach tickets from Los Angeles to New York want to go to their destination by a reasonably direct routing, not via Boise to see the pilot's girl friend and via New Orleans to debark the hostess. They want to ride four-engine equipment if they pay for such accommodations, and they don't want to pay $120 for the same ride which the man in the adjoining seat bought for $50. Most important, they want safe transportation, not overloaded, unairworthy equipment.

It has been CAB's responsibility to police economic aspects of nonscheduled operations and CAA's duty to keep unsafe equipment out of the air. Both have fallen down on their obligations—because of insufficient personnel in many cases. CAB's contemplated revision of the nonscheduled exemption is tantamount to an admission that it is losing the legal game of tag it has been playing with the irregular lines, making new and drastic rules necessary.

Yet despite the numerous "black sheep" in their midst, nonscheduled operators have made air transportation available to thousands of people for the first time. The overall air transportation market has been broadened during a period in which first-class travel, both surface and air, has contracted substantially.

It is doubtful that Pan American Airways and Capital Airlines would be offering skycoach services today but for the activities of irregular operators. Success of these two experiments has induced Northwest Airlines to ask CAB permission to offer four-cents-a-mile coach service between Washington and the Twin Cities—probably starting next month.

CAB's efforts to root out nonscheduled airline operations that give the entire air transport industry a black eye should get universal support. At the same time, the Board should take care not to impose a death sentence on all irregular services without first giving the independent carriers a full opportunity to justify their continued existence.

CHARLES ADAMS

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